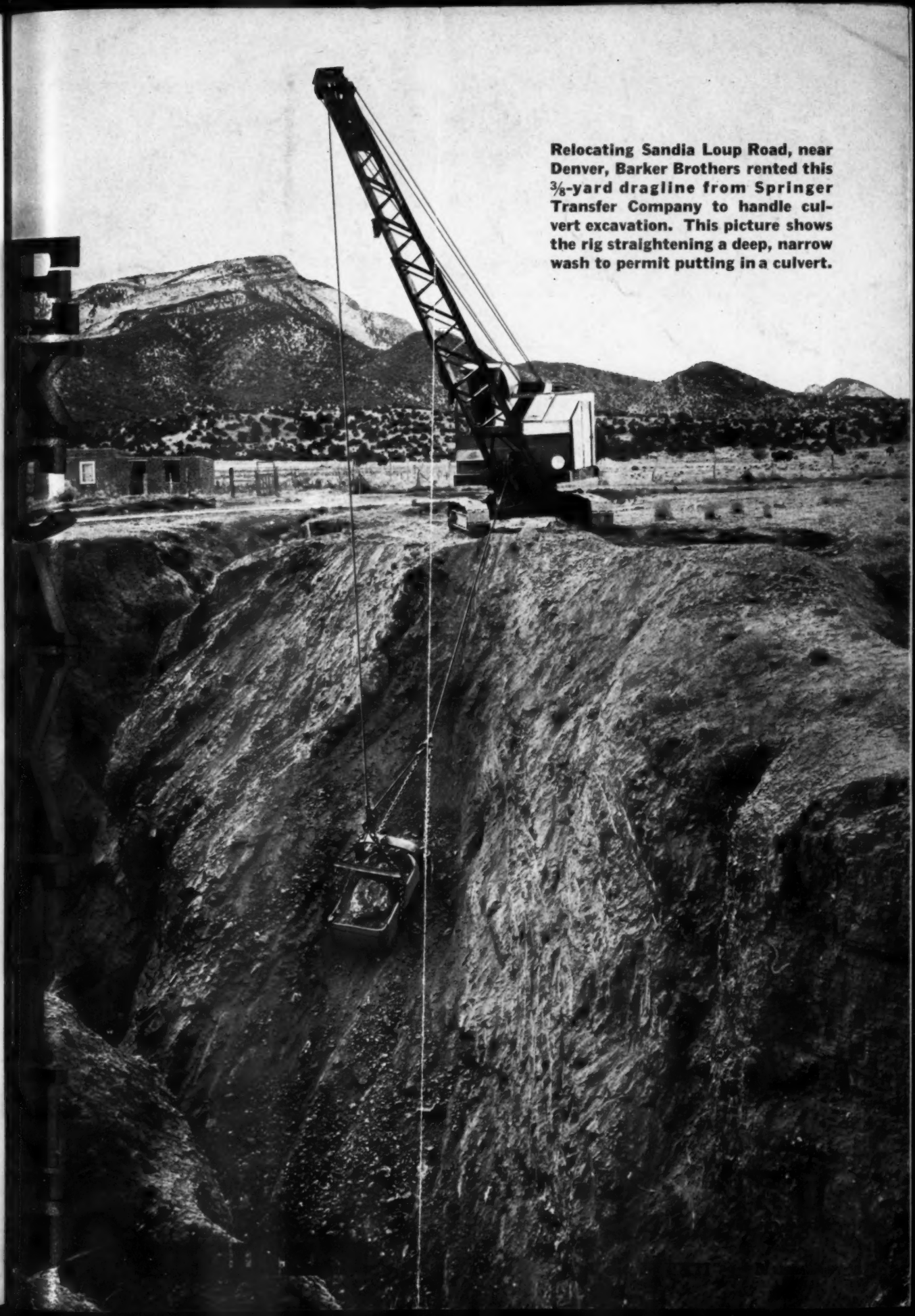

Relocating Sandia Loup Road, near Denver, Barker Brothers rented this 3/8-yard dragline from Springer Transfer Company to handle culvert excavation. This picture shows the rig straightening a deep, narrow wash to permit putting in a culvert.

DOUBLE DUTY

2-Wheel SCRAPER

PERFECT "team work" between the Bucyrus-Erie 2-Wheel Scraper and Bullgrader enables a single tractor, and a single operator, to handle a wide range of economical, high-speed dirt-moving. The Scraper is built to utilize every feature of the tractor's power and maneuverability. It digs effectively, loads easily, fills rapidly to high, heaping loads, and is hauled to the dump at fast tractor speed. The Scraper can dump its load at the rear for culvert work on a road job, or bulldoze it backward over a fill. Bucyrus-Erie 2-Wheel Scrapers are built in 2 sizes, 3½- and 6-yard, *struck-measure-rated.*

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EXCAVATING ENGINEER

FOUNDED 1905

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Drilling For Coal

At United Electric Coal Companies' Fidelity Mine, 9-inch blast holes increase efficiency and improve fragmentation.

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NTERNATIONAL Diesel TracTracTor Moves Dirt for 1⅔ Cents a Yard

p soil varying in depth from 10 to 40 feet is ing removed from a clay pit and dumped into abandoned pit at this low cost by the Inter- tional TD-40 Diesel TracTracTor and 2- heel scraper shown here. This outfit moves 90 bic yards an hour in 24 trips over an average ul of 500 feet. The longest haul is 1,000 feet. cluded in the cost figures for this job are the erator's wages, fuel, oil, and allowances for preciation and repairs.

"On the job" evidence like this proves the nomy and performance of International sel TracTracTors. The value International rvester builds into these powerful, rugged units comes out to the user's advantage when these crawlers go to work.

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NTERNATIONAL Industrial Power

Along the OHIO

Calumet Paving Company builds 21,500 feet of modern concrete highway on Route 66 between Evansville and Tell City, Indiana

AT TROY, Indiana, near Tell City, the Calumet Paving Company is constructing a 4.6-mile section of Highway 66, along the Ohio River. The new road will be 20-foot reinforced concrete except for the distance through the town of Troy, where it will have a width of 36 feet. The contract, totalling $277,000, calls for 168,000 yards of common excavation, 43,000 yards of rock excavation; and 37,000 yards of special borrow to be used in building up the fills. Actual excavation will run considerably higher than the above contract estimates.

In addition to the excavation, the job involves construction of 15 culverts; 4x3, 5x5 and 8x8 in size. About 1,308 lineal feet of pipe must be laid, and paving will require 45,629 square yards of reinforced concrete.

Regular clearing and grubbing, included in the excavation quantities, was begun at the end of February. Tearing up of the old road was started March 1, with December, 1938 being the stipulated completion date. Despite the handicap of prolonged rains, the work is well ahead of schedule. Excavation will be completed about the first of August, and General Manager George Verplank estimates that the entire job will be finished early in October.

The 43,000 yards of rock, principally located in one cut near the east end of the job, and just east of the town of Troy, provide the major excavating problem. This is the largest cut on the job. It has an estimated maximum height of 133 feet, and the total excavation will probably exceed the estimated total of 66,000 yards to be removed. The cut is being made in a steep slope, which leads down to the Ohio River, and which makes loading an especially tough job. The rock is sandstone, with some iron ore and coal, and must be drilled and shot before loading.

Drilling 80 Feet Per Hour

Drilling and blasting is handled on two 7-hour shifts daily, one in the morning and the second in the afternoon. A Cleveland Rock Drill, operating from a 220-foot, 2-stage Ingersoll-Rand portable compressor, is used for primary drilling. A jackhammer, operated from a second Ingersoll-Rand compressor, is used for secondary drilling at the rock cut, as well as for what drilling is required for culverts.

Drilling crews of one man and helper, and blasting crews of one powder man and helper, are under the supervision of Foreman J. S. Ingram. Starting with 2½, 2¼ and 2-inch Timken detachable bits, operated on 6-foot changes, the Cleveland drill averages about 80-feet of hole per hour. Holes range from 12 to 18 feet deep, and are spaced on six-to eight-foot centers. An average of 85 holes, 75 per cent of which are deck-loaded, are fired per blast. Atlas 40 per cent gelatin and Atlas ammonia dynamite are used, with 5½ pounds of explosive being the average charge for a 12-foot hole. From two-and-a-half to three yards of rock are broken per pound of powder.

A Bucyrus-Erie 43-B Diesel shovel, with 2-yard dipper, loads blasted rock to 12-yard International trucks. With the steep side-slope of the cut handicapping loading severely, the 43-B has averaged 1,200 yards of rock per 15 hours. This machine is also used on dirt excavation and for miscellaneous jobs such as digging

• The drill crew puts down 12- to 18-foot holes on the big rock cut. The drill is operated from the 2-stage Ingersoll-Rand compressor in the center. The compressor in the foreground is used for secondary drilling and culvert work.

With rain holding up digging, Calumet Paving Co. sets its 2-yard shovel to removing trees from the right-of-way. Pictures 1 and 2 show digging out the roots. Note the scant clearance below wires. In picture 3 the dipper is used to push over the stump. Pictures 4 and 5 show removal of a full-sized tree. The shovel digs out behind it, then an Allis-Chalmers tractor, with a cable attached fairly well up the tree, pulls it over.

• Top: Drilling in the big rock cut, with the Ohio River in the background. This Cleveland Rock Drill has averaged 80 feet per hour. Center: The three excavators working on one of the big cuts. In the foreground is the 2-yard shovel, with the 1½-yard shovel and ¾-yard dragline on the hillside. Bottom: One of the smaller cuts, being handled by dragline and tractor-mounted bulldozer.

out and pushing over large trees which have to be removed in widening the right-of-way.

Bulldozers Handle Side-Hill Cut

East of the big rock cut is a side-hill earth cut with a maximum height of 100 feet above grade. This cut was made entirely by tractors and bulldozers. Two units, an Allis-Chalmers "LO", equipped with Baker bulldozer, and a Caterpillar "50" with a Euclid blade were used for this cut, starting at the top and blading the material down as illustrated in an accompanying picture. Deepest cut on the west end of the job has a maximum height of 45 feet.

The necessary fills, all west of the town of Troy, are long but not deep. An 18-foot fill at the extreme west end of the job is the deepest. A 15-foot fill just west of the town contains the largest volume of dirt.

Common excavation, both cut and borrow, is done with a 34-B Bucyrus-Erie, 1½-yard shovel, loading to pneumatic-tired Euclid eight- and 10-yard dump wagons drawn by Allis-Chalmers tractors. This shovel has loaded an average of 2,000 yards per 15-hour day. As fills are built up, they are shaped with a Caterpillar-drawn Ateco hydraulic scraper and roller.

Excavation for culverts, ditches and pipe trenches is handled by a Bucyrus-Erie 19-B dragline swinging a ¾-yard bucket. The 1,308 lineal feet of pipe required is divided as follows: 510 feet of 15-inch V. C. pipe; 308 feet of 24-inch V.C. pipe; 210 feet of 30-inch R.C. pipe; 80 feet of 18-inch R.C. pipe, and 200 feet of 15-inch, corrugated metal pipe.

Scrapers to Do Final Grading

Final grading will be done with 12-yard LeTourneau scrapers, which are at present working on

a 280,000 yard job at Buckskin, one of 5 jobs the Calumet Paving Company now has under construction. Compacting will be done with a 10-ton Huber roller, and two 1-ton Hercules rollers. A Rex 27-E paver will be used in laying the concrete.

Anyone visiting this job could not fail to be impressed by the fine shape in which the equipment is kept. Three mechanics inspect all equipment regularly, and handle necessary repair work. The two shovels and the dragline are regularly inspected and lubricated by the oiler assigned to each. General lubrication is handled by one of the new Alemite portable service stations. Compressor and high pressure grease guns, mounted on a Ford truck chassis make this unit extremely flexible. It can get from one end of the job to the other in a hurry, and is effective in reducing maintenance time, as well as lost time, to a minimum.

A total of 80 men are employed on this job, which is operated on two 7-hour shifts daily. The work is being done for the State Highway Department, with N. M. Blackburn as project engineer.

Superintendent Abe Verplank is in active charge of work for the Calumet Paving Company, on this contract. "Active" charge is a good description, too, as Mr. Verplank is always on the go, from one end of the job to the other, directing operations or taking the controls of some of the equipment, whatever the problem of the moment may require.

The building of this section of Route 66 is a constant source of joy to the 562 inhabitants of Troy. If one of the shovels is to dig out a stump in one end of town, the crowd is there. If the rig is moved three blocks down for another job, the crowd follows. When the contract is complete, the whole town will know all the steps in building a modern highway.

• **Top: This side-hill earth cut was made by the Caterpillar "50" and Euclid bulldozer shown here, and by an Allis-Chalmers "LO" equipped with Baker bulldozer. Center: The 19-B dragline excavates for a culvert, with Troy in the background. Bottom: Mixing concrete for a culvert.**

Earth Engineering

Bureau of Reclamation Uses Scientific Control for Excavation and Placement of Earth Materials

By JACK HAVARD

U. S. Bureau of Reclamation Photos.

ENGINEERS of the U. S. Bureau of Reclamation have gone back to the soil. No agrarian philosophy but cold economic and scientific necessity have impelled this earthward movement. The construction of a great series of earth dams, combined with the comparative ignorance long surrounding soils mechanics, forced the Bureau to establish means for control and research. As a contribution to soils engineering, the results have been noteworthy.

In the fall of 1933, when the P.W.A. program was getting under way with its many proposed dams, the Bureau of Reclamation organized the Earth Materials Testing Section, now a part of the Materials, Testing and Control Division. It is this section, located in well-equipped laboratories at the Customhouse in Denver, with which the present article is chiefly concerned.

Like all other sections of the Materials, Testing and Control Division, the earth laboratories are guided by a one-word motto: "Cooperation." This means cooperation with the Bureau's design and construction divisions, with the inspectors in the field, with other testing and control sections, with outside organizations engaged in similar work, and, neither last nor least, with the contractors who are doing the actual construction. It means, too, the dissemination of information within the Bureau and to the engineering world at large.

From the inception of a project, the earth materials laboratory has a significant influence on its development—first, in determining the character and suitability of available embankment and foundation materials; second, in training inspectors and assisting the earth dam design section in construction control; third, in the development of methods for field control so that construction can be held consistent with design, and, fourth, in contributing information based on original research.

The work of the laboratory is primarily concerned with earth dam construction, although there are occasional investigations into canal embankments and other structures. During one period in 1937, the laboratory was conducting simultaneous tests for 15 different dams, and at the same time was still endeavoring to make order out of chaos in the engineering of earth materials.

The Bureau's earth dams, intended primarily for irrigation storage, are located in every section of the West. Some of them are of large dimensions. The biggest in the present program is Vallecito Dam near Durango, Colorado, which will contain 3,000,000 cubic yards of earth fill and 485,000 cubic yards of rock. Its height will be moderate, 123 feet. The Alcova Dam, recently completed, is considerably higher (180 feet above river bed), but contains a smaller amount of material—1,000,000 cubic yards of earth and 450,000 cubic yards of rock. (Fort Peck Dam, the largest in the world, with a volume of 100,000,000 cubic yards of earth, is not a Bureau project, but is under the direction of the Corps of Engineers, U. S. Army.)

● **Pine Valley Dam, part of the Ogden River project in Utah, is an earth fill dam built for the Bureau of Reclamation by Utah Construction Company and Morrison-Knudsen Company. The Bureau's Denver laboratory tested materials going into the dam.**

Materials

Behind the gouging teeth of power shovels, the straining cats of tractors, the lumbering bulk of rollers — behind all the roaring activity of a big job—is a quiet and continuous program of materials' study that has sometimes a direct, sometimes an indirect, effect on the contractor's methods.

Early in the designing of an earth dam, long before a piece of contractor's equipment has been moved on the site, careful sampling of material which must be excavated is necessary—that is, material removed in reaching bed rock, building spillways, and so forth. The sampling is done by field crews directed by the design

● Agency Valley Dam, Vale project, Oregon, is another Bureau of Reclamation dam in which the laboratory played its part. Contractor on this project was Hinman Brothers.

section. Testing is accomplished by the Denver laboratories until the project is sufficiently established to have a field laboratory. Thereafter, the routine work is done in the field.

The next step depends on the type of material discovered in the required excavations. For instance, if the material is fine-grained and impervious, field men will explore the site for semi-pervious material and for rock fill, the object always being to provide a well-balanced assortment of types and sizes for actual placement, according to design.

Detailed samples from the proposed borrow pits are tested by the Denver laboratory and the results turned over to the design section, which in turn makes up a tentative plan of the distribution of materials, necessary in designing the structure. The tests made are concerned with physical properties and performance—compaction, percolation-consolidation and shearing strength.

The Bureau places much emphasis upon careful study of the borrow pit, mapping it in detail to show the distribution of materials. The engineers believe, too, that the materials to be used in the structure should be brought to the proper moisture content in the borrow pit instead of on the embankment. Usual methods are to moisten the pit with sprinklers, to flood the surface area in ponds, or to wet the face of a cut with a hose during excavation.

It is always important to investigate the foundation. Efforts are made, by means of special apparatus, to obtain representative in-place samples, which are subjected to physical property tests if there is any doubt as to the adequacy of the materials.

F. D. Christhilf

Francis Dorsey Christhilf, for the last 20 years one of the best known highway contractors in Maryland, died at his home recently.

Mr. Christhilf was a partner in the firm of Christhilf & Ensey, which he and John H. Ensey founded in 1918. The Crain Highway, Washington Boulevard, the Governor Ritchie Highway, and a number of roads in Southern Maryland were built by this firm.

Born in Baltimore 51 years ago, Mr. Christhilf was a graduate of Baltimore City College, and was for a time an engineer for the State Roads Commission and the City Sewerage Commission. He was a member of the American Society of Civil Engineers, and was for two years president of the Maryland Highway Contractors' Association. His passing means a real loss to the highway field and his friends and co-workers in it.

Mr. Christhilf is survived by his widow, two sons, a brother, and two sisters.

When construction has begun, the field men make the routine tests and the attention of the Denver laboratories is devoted to special problems which arise during the progress of the work. For instance, the field or design sections may not be satisfied with the material as it is being used, in which case samples of the questionable soil will be sent to Denver for, perhaps, shear tests or other special performance tests.

During the progress of the job, many control tests are made. The samples taken are tested in the field for physical properties. Every ten days a report is written in the field on construction progress, physical properties of materials used and condition of the materials. Copies of this report go first to the design section and then to the earth material laboratory. If for any reason the Denver engineers think the results unsatisfactory, an examination is made and any necessary changes initiated. As construction goes on, representative samples are tested in the field and at Denver for a record of how the materials were graded and placed in the embankment.

During construction, too, some of the more purely research projects are put into effect. Settlement measuring devices — telescoped pipe, equipped with shields that move with the soil and may be measured by means of special plumb bobs—are installed as the filling and compacting progresses. Hydrostatic pressure indicators, which are valuable in supplying data for the control of reservoir operations, are now being placed in all Bureau dams, during or just after construction.

Testing

Testing in the earth materials laboratory was originally based on a technique developed by the Los Angeles Bureau of Water Works and Supply and described in the technical press by R. R. Proctor. Modifications of the original pro-

gram have, of course, developed as time went on, and a more-or-less standardized series of tests decided upon. But even these are subject to constant change as the hitherto inexact science of soils mechanics is advanced by research and greatly expanding engineering experience.

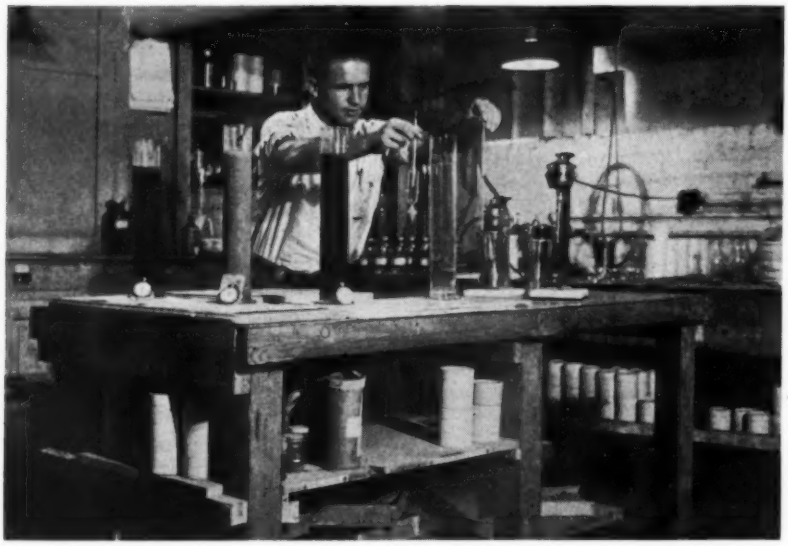
These tests are made for definite purposes, and somewhere in the Bureau's control of construction the contractor will find them in the background.

All tests, except the size analysis, are made on material passing a ¼-inch screen. The general opinion is that if the predominant fine material possesses the proper qualifications for the job, there will be no difficulties with the subordinate plus ¼-inch material unless the oversize is in such excess that it reduces the efficiency of compaction. Then, too, the size of the test equipment is more convenient to handle and the samples are small enough so that a larger number of tests can be readily made. A brief description of the routine tests follows:

MECHANICAL ANALYSIS. This is a widely known test which gives a good mathematical and mechanical description of the soil through the particle-size determination. The analysis is in three parts: (1) determination of the per cent weight of particles retained on 6-inch, 3-inch, 1½-inch, ¾-inch and ¼-inch screens; (2) determination of particle sizes on the standard sand screens plus 200-mesh, and (3) a hydrometer analysis of the fines passing the 200-mesh screen. Results are plotted on one distribution graph.

• From ¼-inch to minus 200-mesh, the standard testing sieves, as illustrated above are utilized in the Bureau's mechanical analysis.

COMPACTION. It is of vital importance for good dam construction that the material be compacted at its maximum density. The compaction test, therefore, is of much significance. Essentially it is simple. A number of samples, varying in moisture content from one which is much too dry to one which is much too wet, are compacted in a metal cylinder by means of a definite number of blows from a weight dropped a given distance. A density-moisture curve is drawn which not only reveals the amount of moisture necessary for optimum density, but also provides the design section with information as to the probable density of the structure, a fact necessary in computing loads and pressures.



• Sizes minus 200-mesh are analyzed by means of hydrometer tests.

PENETRATION RESISTANCE. Closely parallel to the test on compaction is one of the resistance of soil to penetration. It is made by forcing a cylindrical-ended needle into compacted soil to a depth of about three inches and then reading the force required to cause an additional penetration of one-half inch per second. This is a test widely used in the field, for the engineers have learned that under a standard amount of compaction the penetration resistance may be used for construction moisture control —that is, under such conditions penetration is a function of moisture content.

PERCOLATION. The percolation test is an indication of the seepage capacity of a soil and is especially helpful in the selection of material for the various parts of a structure and so is of much assistance to the designing engineers. The test is made by measuring the flow of water through a specimen that is usually com-

• General view of the shear room, one part of the earth materials laboratory in Denver. The 30,000-pound shear machine is prominent on the right.

pacted at optimum density and water content, and under a consolidating load equivalent to about 20 feet of fill. Advantage is taken of this test, also, to observe the settlement of the soil specimen before and after loading and with complete saturation.

CONSOLIDATION. The above four tests are all made in the field as well as in the Denver laboratory, but the remaining ones are made, as a rule, exclusively in the laboratory. The percolation apparatus is used for the consolidation tests, but more detailed observations and computations are required, and particular care must be taken in noting the loading of samples, the drainage conditions when loading, the addition of water and its effect, and the rate at which the sample changes volume. This test, essentially the observation of volumetric change of a loaded soil specimen with respect to time, provides a means of estimating the settlement and other behavior of the actual structure.

SHEAR. The shear test is made in a two-piece container so arranged that the upper half is stationary while the lower half is pulled out, thus subjecting the soil to shear over an initial surface of one square foot. A number of tests are made under various load conditions, and the maximum resistance to sliding is the ultimate shearing strength for the normal load applied. Indirectly, the cohesion and angle of internal friction are also obtained. Strain meters are so connected to the specimen that both the consolidation under normal load and the deflection under shearing load may be measured to one-thousandth of an inch. The shear test is especially useful in the computation of required slopes for embankments.

SPECIFIC GRAVITY. The specific gravity is obtained by ordinary methods except that in working with a soil it is necessary to be particular to remove all entrapped air by application of a partial vacuum, by boiling, or both. The specific gravity is useful, of course, in estimating the amount of voids in soil specimens.

SOLUBLE SOLIDS. A determination of the soluble solids in a soil is necessary in only a few cases. If the test indicates that there are large amounts of solids which are readily soluble in water it is considered advisable to test the specimen by a process of continued leaching, or, further, to make a thorough chemical analysis.

In addition to the above, many tests of a special nature are made when necessary.

Trends

The engineers of the earth laboratories fully recognize that soils mechanics and soils engineering are relatively new fields which, until just the last few years, have been without authoritative technique or literature. Necessity has forced them to use testing methods that can be reliably interpreted in terms of construction results, but that is not enough. The present tests are admittedly inadequate, and they represent at best only empirical methods based on physical and chemical soils phenomena which are still obscure.

Consequently research must go forward with routine testing, but the research of a materials control laboratory under the pressure of construction activity must be concise, practical, scientifically sound.

The work has been largely of two types:

First, comparisons to show how construction control of density and moisture has an advan-

(*Continued on page 442*)

Shortening A River

Rio Grande Rectification Job Not Only Controls Flood Waters, But Settles International Boundary Dispute

By AL. P. NELSON

SOME years ago when Elephant Butte Dam was constructed in the mountains of New Mexico to control the flood waters of the Rio Grande, irrigation in the huge El Paso-Juarez valley was extended to bring many additional acres of former desert land into production.

But while this big dam, impounding 2,600,000 acre feet of water, enough to cover to a depth of six inches an area as big as the state of Massachusetts, provided sufficient water for all year around irrigation, there were certain damaging conditions it could not correct. One was the amount of water flowing into the Rio Grande from creeks and arroyos below the dam, and second, the fact that around El Paso the Rio Grande frequently changes its course through low banked lands, and in flood season often overflows its banks, causing great damage to agricultural lands in the United States and Mexico.

The tendency of the Rio Grande to change its course in the El Paso-Juarez Valley, too, has resulted in international complications in the past, for the 1853 treaty between the United States and Mexico provided for the international boundary line to be the middle of the river. Thus when the river changed its course, the boundary line presumably changed with it.

Agreement on River-Straightening In 1933

In 1889 the International Boundary Commission was formed to settle this aggravating boundary dispute between the two nations, but it wasn't until 1933 that a definite agreement was reached to straighten the river below El Paso, to stabilize the international boundary, build levees and so prevent further changes in the famous river and to prevent flood damage to valley agricultural lands of both nations.

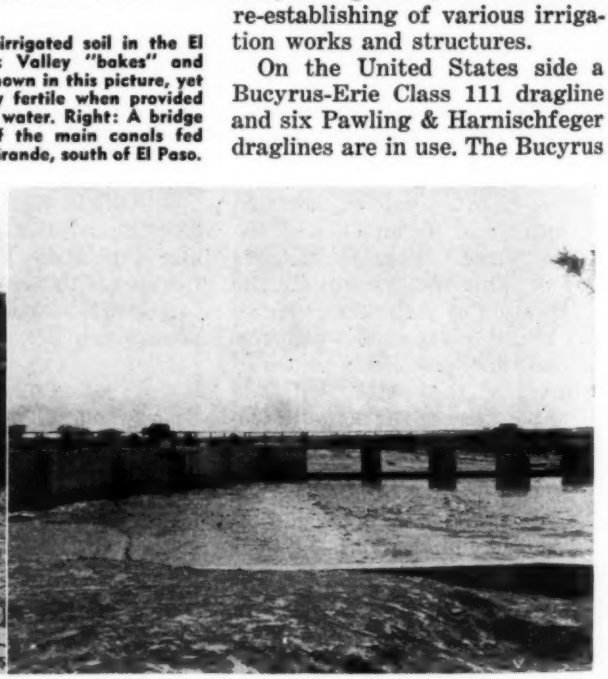
Such an arrangement in international negotiations for settling a boundary question is very unique, but it appears to be satisfactory. River rectification work by U. S. and Mexican engineers south of El Paso was practically completed July 1.

The work has been under supervision of L. M. Lawson, American commissioner; J. Pedrero Cordova, Mexican commissioner and their aids, C. M. Ainsworth, consulting engineer and Crawford S. Keer, field engineer for the American section and J. C. Bustamante, consulting engineer and Rodriquez Gutierez, field engineer for the Mexican section.

5,300,000 Yards of Excavation

Except for surfacing of levee tops this river rectification job is essentially a dragline job. The project involved the acquisition of right of way and segregated tracts, as well as the handling of 5,300,000 cubic yards of excavation and 9,000,000 cubic yards of embankment, and the construction, enlargement, extension and re-establishing of various irrigation works and structures.

On the United States side a Bucyrus-Erie Class 111 dragline and six Pawling & Harnischfeger draglines are in use. The Bucyrus



• Left: Unirrigated soil in the El Paso-Juarez Valley "bakes" and cracks as shown in this picture, yet is extremely fertile when provided with ample water. Right: A bridge over one of the main canals fed by the Rio Grande, south of El Paso.

• This air view illustrates clearly the straightening of the Rio Grande. Elimination of loops like those shown has shortened the river channel from 155 to 88 river miles, has helped flood control, irrigation and international boundary settlement.

dragline is of 3 yard capacity with 110 foot boom. Of the P&H machines, two are of 1½ cubic yards capacity with 70 foot booms, three are of 2 yard capacity with 75 foot booms, and one is of 3 yard capacity with 105 foot boom.

Work on the Mexican side was first handled by 4 Bucyrus draglines, now operating in the interior of the Republic of Mexico and later by two P&H draglines.

Other equipment on the U. S. side includes 2 motor graders (Austin-Western and Caterpillar Diesel), 8 Caterpillar and Allis-Chalmers tractors, 4 Carryall LeTourneau scrapers and 10 trucks, mostly Internationals.

Cutting 67 Miles from the River

Not a particularly difficult job from an engineering standpoint, the Rio Grande rectification job nevertheless is one of huge proportions. Between El Paso and Fort Quitman the river channel was shortened from 155 river miles to 88 miles by eliminating loops and the location had to be so fixed that the land cut from one nation would balance the land cut from the other. Levees range from 6 to 15 feet in height. The United States has built 140 miles of levees and Mexico 42 miles.

The drop of the river channel was changed from 1.8 feet to 3.2 feet per mile. The new stabilized international boundary is the center of a pilot channel with a maximum depth of 9 feet (average 6 feet) and a bottom width of 66 feet. This pilot channel is in the middle of a flood channel 600 feet wide. The floodway will accommodate discharges of 11,000 cubic feet per second. The lowered river grade and deepening of the river channel also resulted in lowering the ground water levels.

Rectification, say engineers, will eliminate the flood menace in this area, and will also help make the most beneficial use of the irrigation supply and give better drainage to irrigable lands, as well as increase sand carrying velocities at normal low water stages in the river. River rectification is also expected to add 5,700 acres of productive land to the El Paso-Juarez Valley where 60,000 acres are already under cultivation. The new wealth thus created should amount to about $1,000,000.

Work Began In 1934

Inasmuch as the United States will benefit most from the river rectification, the 1933 agreement with Mexico provides that Uncle Sam will pay 88 per cent of the cost and Mexico 12 per cent. Work on the river rectification project was begun in May, 1934 by an allotment of $3,330,000 PWA funds. This has since been increased, so that this project, along with the erection of Caballo Dam, 100 miles northwest of El Paso, will cost in the neighborhood of $6,000,000.

Caballo Dam, an earth fill structure 80 feet high with concrete spilling and outlet, has a reservoir capacity of 350,000 acre feet. Originally this project was started for flood control but will also act as an equalizer for the producton of firm hydro-electric power, at Elephant Butte Dam.

According to a recent estimate given by Mr. Lawson, the cost of the U. S. Part of river rectification is about $4,000,000. Irrigation improvements under Elephant Butte Dam are valued at $15,555,991, urban property outside of El Paso at $4,410,345; rural property at $33,844,017, with the annual valley crop valued at $11,700,000.

U. S. Cost Data

Cost data and quantities for the U. S. part of the river rectification project up to July 1, 1938 are, according to government engineers:

Total construction cost to date	$3,500,000 Total to Date
Length of levees constructed	140 miles
River channel excavated	80 miles
Earthwork, all classes and methods	14,300,000 cu. yds.
Clearing (total cost of clearing, including grubbing 3,375 acres and plowing 2,632 acres—$197,000)	
Concrete in structures	6,400 cu. yds
Reinforcing steel in structures	500,000 lbs.
Employment	2,700,000 man hrs.
Present personnel	245 employees

Data on earth work accomplished by dragline:

Class of work	Quantity Cubic Yards	Total Oper. Cost	Cost per Cu. Yd.
Channel Excavation	4,524,000	$299,245	$0.066
Levee Embankment	5,572,000	404,075	.073
Leveling Floodway	543,000	34,915	.064
Miscellaneous	1,028,000	68,610	.067
Totals	11,667,000	$806,845	$0.069

Irrigation Charges

In the El Paso-Juarez Valley at the present time irrigation charges total $4.38 per acre annually, divided as follows: two acre feet of water $2.20; payment on cost of Elephant Butte Dam and irrigation system $1.77 per acre, and service charges of 41 cents per acre. Land is now selling for $150 per acre up to $250 and $300 for farming purposes. Cotton, alfalfa and truck are the chief crops in this big fertile valley at the present time. Fruits are also raised to some extent and there is considerable livestock and poultry on various farms.

After river rectification, sanita- becomes the big problem in the Valley. Concerning this, Mr. Lawson recently said,

"The heavy use of water for irrigation creates a problem on the border for both Juarez and El Paso in disposing of the effluent from sewage. The problem must be handled jointly for the solution to be of benefit to both communities."

Engineering data is being gathered for storage dams on the Lower Rio Grande where three to four million acre feet of water annually is uncontrolled, and on water supplies as the basis of treaties with Mexico for water division.

"The United States has had a treaty with Mexico since 1906 for division of water at El Paso," says Lawson, "but Mexico has placed thousands of acres in cultivation on the Colorado river, and Texas has done likewise in the Lower Rio Grande Valley without water treaties. These treaties, if made, will be handled through diplomatic channels."

Thus it seems as if the famous and romantic Rio Grande, after wreaking flood havoc on man for many centuries will soon be tamed, and surely should never again cause international tension because of a shifting course in the El Paso-Juarez Valley.

• **Left: Equipped with 110-foot boom and 3-yard bucket, this dragline is one of seven handling excavation work on the United States side of the Rio Grande. Right: A full irrigation canal. This water provides irrigation at an annual charge to the farmer of $4.38 per acre.**

Equipment

you ought to KNOW ABOUT

Spring Lift on Hydraulic Scrapers

The road machinery division of Gar Wood Industries, Inc., Detroit, Michigan, has engineered a new spring lift for all four models of Gar Wood hydraulic scrapers. The Gar Wood spring-lift mechanism is designed to prevent tractor stalling and loss of time during digging operation. When the cutting edge of the bowl lip enters

the ground, there is plenty of reserve power. At this time, the large loading springs are compressed. When the load increases and the tractor is laboring, the operator merely touches the blade control lever. Then, manufacturers claim, the cutting edge of the Gar Wood scraper snaps out of the ground. The springs, without consuming any tractor power, reduce the cutting depth and relieve the drag on the tractor, thus leaving the power for pulling the scraper and preventing stalling.

Truck Tires

A new line of truck tires is announced by The B. F. Goodrich Company, Akron, Ohio.

Pioneering in the development of the commercial tire for ½ and ¾ ton equipment, Goodrich now offers the operator of light equipment a choice of the Express Type Heavy Duty Commercial for ordinary service or the new line for service where traction is a major requirement, in mud, snow or any off-the-pavement service where the going is tough.

The tire is made in a complete range of sizes. The tread is of an entirely different appearance and with different characteristics than the ordinary design, its greater depth accounting for its valuable super-traction qualities.

Sub-Surface Explorer

The Geographical Instrument Company, 1315 Half Street, S. E., Washington, D. C. have recently developed an apparatus for discovering underground conditions prior to drilling and excavation. It is intended to place a useful method of sub-surface exploration within the means of a large circle of potential users, as the manufacturers believe it is simple, light, easily portable, and inexpensive.

Improved String-A-Lite

Sullivan Machinery Company has announced new improvements in String-A-Lite, the moisture-proof lighting cable that provides the safety and utility of a permanent installation with the wiring simplicity of a temporary job.

String-A-Lite consists of No. 10 two - conductor rubber - covered cord on which moisture-proof end connectors and lamp socket connectors are integrally molded. Detachable lamp sockets are of molded rubber or bakelite with prong type connectors.

Write to Sullivan Machinery Company, Michigan City, Indiana, for prices and illustrations.

"Caterpillar" Auto Patrol

A heavy-duty, self propelled road grader, the Diesel No. 12 Auto Patrol, has been announced by Caterpillar Tractor Company, Peoria, Illinois. Designed for efficient and economical road building as well as road maintenance work, the new machine has a range of useful blade positions surpassing the modern blade grader. In addition to high or low bank cutting positions, the blade can be turned completely around on the full revolving circle. With the blade mounted in the center position on the blade beams, the new Auto Patrol permits a ditching position on either side, with the toe of the 12-foot blade directly behind the front ditch wheel, and clearance to prevent clogging.

A six-cylinder "Caterpillar" Diesel engine delivers 66 brake horsepower, while a gasoline starting engine insures starting regardless of atmospheric temperatures. The transmission offers six forward speeds and two reverse. Low speed is 1.8 m.p.h., second speed is 2.8 m.p.h., and high speeds of 4.3, 6.8, 9.6, and 15.2 m.p.h. are available.

The new Auto Patrol is offered with tandem drive and leaning front wheels as standard equipment.

(Continued on page 426)

EXCAVATING ENGINEER

FOUNDED 1935

A Monthly Publication
Devoted to the Excavating Industry

The Excavating Engineer Publishing Co.
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Are You "Selling" Good Roads?

It has only been during the last few years that we have approached our highway system and program scientifically. Our primary roads were built on a "get-from-here-to-there" basis.

Today, we know that roads should be built to fit the traffic they must carry. Surveys being made in the majority of states are providing adequate knowledge for future planning and building. Engineering research has given us a wide range of road types to fit varying needs. Road builders have developed the equipment and skill to build the most and best roads for the money available. Growing anti-diversion sentiment, and establishment of the federal-aid principle are assuring a continuation of regular, sizable funds.

But there is still a need to "sell" roads to the country at large. Today's highway builders have the "tools" to do a fine job; they must now create the opportunity to use these tools to maximum advantage.

As a highway contractor, you may know that County A in State B has a traffic pattern which indicates a need for 20 miles of super-highway; 100 miles of 22-foot, high-type surface highway; 300 miles of low-type pavements; and 700 miles of stabilized earth and gravel roads. Naturally, the State and County highway departments know these needs too, and they'll proceed with the construction as fast as requisite funds are available.

But why shouldn't YOU help do the "selling" job to the people in your community? As with any good product, salesmanship in this case consists in making the people who pay for these roads understand clearly and honestly just what they can get for their money. Show them how they will profit by the construction of the necessary roads. Show them how you can give them the most road for their dollars.

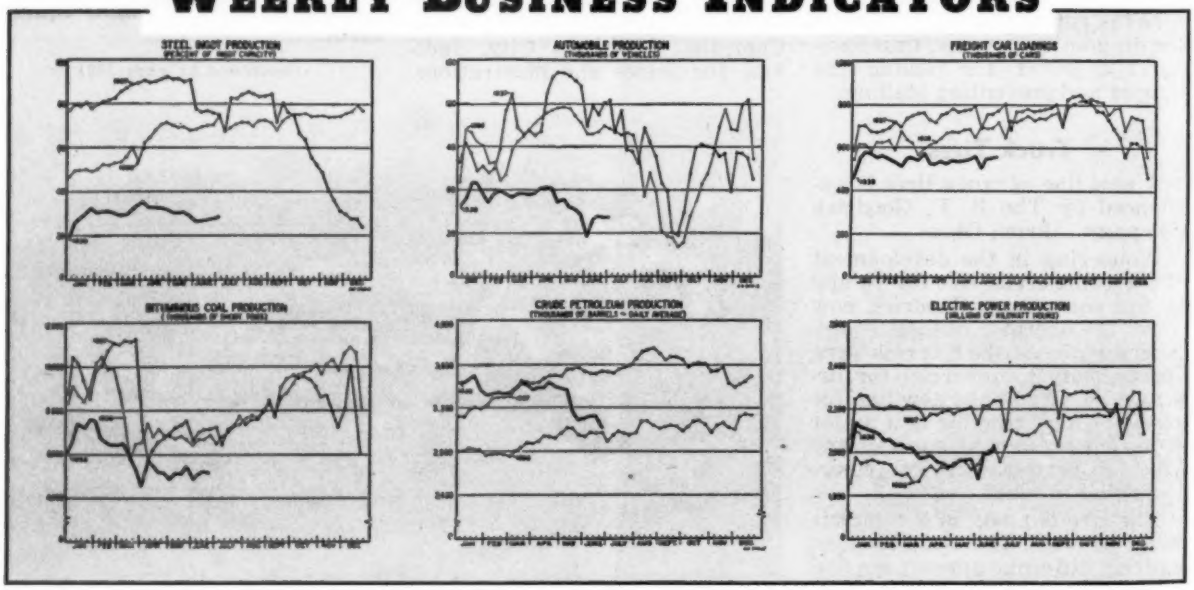
In this connection, a recent booklet published by the Allis-Chalmers Manufacturing Company comes to mind. Titled "Good Low-Cost Roads," this booklet is written for tax-payers, farmers and others who are interested in roads but not experts in the field. It outlines the various types of low-cost roads, tells something of how they are built, what uses they are fitted for, and about what they may be expected to cost.

If you are interested in obtaining a supply of these booklets to give to township or county officials in your community, and to influential private citizens, you can get them without charge by writing to Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin. You may find the booklets of real value in helping you "sell" roads, and your services as a road builder, in your community.

Copies For You

The article on the following page is reprinted from one of a series of bulletins issued by S. D. Warren Company to describe the American Business System. The bulletins are issued to the company's employees. It seems to Excavating Engineer that these bulletins present the actual fundamentals of our system so clearly and well that you, and your employees, may find them interesting and valuable. If you would like to give copies of the following article to your employees, we will gladly furnish you with attractive reprints on heavy enamel paper, for one cent apiece, which is the cost to us. Ten copies is the smallest number we can send to any one person. Address your requests for reprints to Excavating Engineer, South Milwaukee, Wis. Tell us how many you want, and enclose a check or money order covering the cost.

WEEKLY BUSINESS INDICATORS



Who Are Business Men?

A BUSINESS MAN is one who invests his own money in an enterprise which gives employment to other people or to himself.

A man who is paid by the Pride Fuel Company to drive a truck is an employee. If he saves enough money to start a trucking business for himself, he becomes a business man. To do that he will need enough money to rent or to buy a truck, to pay the expense of operation, and to feed and clothe himself until he gets enough business to keep him going.

Business Man

When this truck driver becomes a business man, he is pretty much the same fellow that he was when he was employed by Mr. Pride. He looks the same, he buys in the same stores, has the same friends. If he was an earnest, honest worker for Mr. Pride, he will continue to be that. If he was a dependable and sympathetic friend, he will continue to be that. If he was the kind of fellow who took advantage of his friends, he probably will continue to take advantage of people.

If a salesman in one of your local stores saves some money and opens a small store of his own, he becomes a business man. To do that, he will need enough money to buy fixtures and a stock of goods and to rent part of a building. He will have to risk his savings on the chance that he can find customers to buy his goods, so that he can eat and pay his bills. Therefore, his responsibilities will be greater than they were when he worked for somebody else, but otherwise he will be no different than he was before. He will be no more honest and no less honest, he will be no smarter, he will be no more friendly nor less friendly than he was when he worked for somebody else.

There are a great many men and women in America who go into business in another way. They don't start stores or factories or trucking businesses. They don't give up their jobs to go into business. They keep their jobs, but they invest their money in stocks or bonds, and, thus, while working for one company, they help to finance other companies. By this method they invest their savings in a business, become owners of some small part of that business and risk their money with the hope of getting some profit. The money so invested helps to make jobs for other men and women and thus creates employment.

Employee

A man who buys one share of Telephone Company stock, or one share of General Motors stock, becomes a part owner of the Telephone Company, or a part owner of the General Motors Corporation. He is helping to make jobs for phone operators or for automobile workers and is, therefore, an employer. He is investing his money in business with the hope that it will bring him a profit—and so he is a business man.

There are a number of such business men in Cumberland Mills. They have jobs in the mill and at the same time they are helping to make jobs for other people in other businesses. They are earning pay for their own work and, at the same time, they are profiting from the ownership of some part of the Telephone Company or General Motors Corporation or General Electric Company or General Foods Corporation. The fact that they are business men doesn't change their basic character in any way.

The processes of becoming a business man or a doctor or a superintendent or a contractor do not alter the character of a man because character is established by the time a man is fully grown. If his character is weak or bad to begin with, it will be bad whether he works for himself or for someone else. If his character is strong and good, it will prompt him to try to act right in any position.

People are all pretty much alike—whether they are employers or employees or doctors or electrical engineers—whether they come from Maine or Indiana. Their experiences and training and tastes vary; but the average of integrity is about the same everywhere among all trades and professions. They average up as pretty fine people.

NOT in the *Contract*

"Mamma, what does the word 'gentleman' mean?"

"That, my little darling, is a word we ladies generally apply to a man we don't know very well."

Have you heard the story about the man on relief who was so accustomed after years of unemployment to having everything done for him that he went out and married a widow with three children?

Hostess (gushingly): "You know, I've heard a great deal about you."

Prominent politician (absently): "Possibly, but you can't prove anything."

"Miss Alice ain't home," said the colored maid to a caller. "She's done gone down to de class."

"What class?" asked the caller.

"Miss Alice gwine to be married, you know, an' she's taking lessons in domestic silence."

"There are three kinds of liars," said Judge Taft at an American Bar Association banquet. "There is a damned liar, the expert witness and the after-dinner speaker who says: 'I'll not detain you long.'"

Doing business without advertising is like winking at a girl in the dark. You know what you are doing but no one else does.

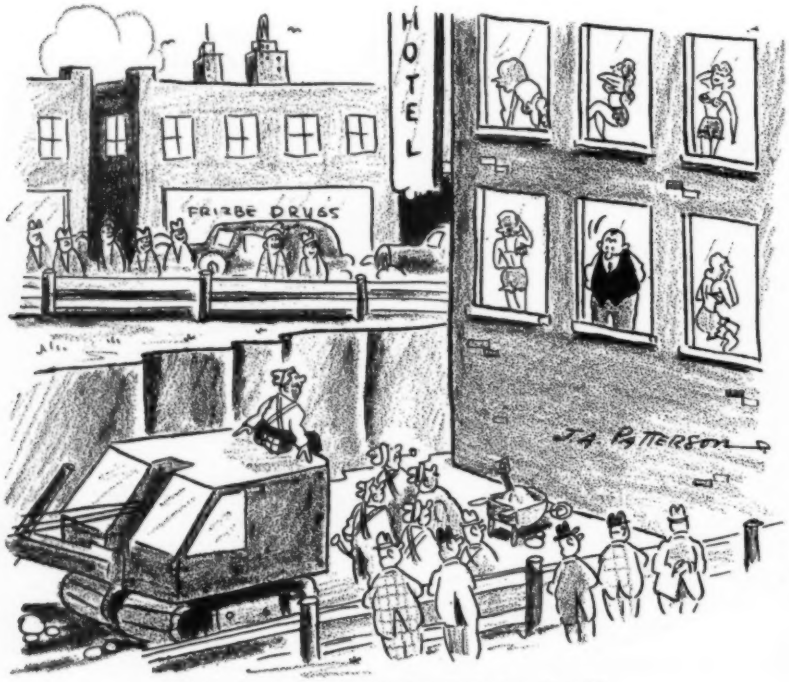
"I'm a self-made man."

"You're lucky. I'm the revised work of a wife and three daughters."

"Let's see, you're an optimist, aren't you?"

"A kind of one. I believe the world is getting better every day; but I'm not so sure about the nights."

All of us are working for the Government. The trick is to get paid for it.



"Now I wonder why they're all staring at me?"

Mr. Brown stopped in at the Jones Drug Store to get a can of Kill'em & Burn'em insect powder.

"Sorry, Mr. Brown, we are out of that but have a new deal here called the W.P.A. faint producer."

Brown—"I never heard of that before, how does it work?

"Well, it don't kill them, but it makes it possible for you to kill them. You just sprinkle a little of the powder around in the leaves, where they are liable to be stirring around and they seem to get sort of spring fever, and lean against a weed. Then all you gotta do is to step on 'em."

Burglar—"Please let me go lady. I've never done anything wrong."

Old Maid—"Well, it's not too late to learn."

"Jose turned tail when the enemy advanced."

"The skunk!"

"Oh, no, senor! When a skunk turns tail, the enemy does not advance!"

Flattery is 90 per cent soap—and soap is 90 per cent lye.

"Is this the kind of book a woman should read?

"No, but it's the kind you can't keep her from reading whether she should or not."

The sweet young thing had never before seen an elephant. Therefore, when she looked out in her garden one day, and saw one there she became quite excited. Hurriedly calling the police, she exclaimed: "Oh! officer, hurry out here. There's a terrible looking monster out in my garden; he's pulling up all of my vegetables with his tail."

"And what's he doing with them, Madam?" asked the officer.

"Oh! officer, you wouldn't believe me if I told you."

Announcing the JA-35 JACKHAMER

STILL *More* POWER PER POUND

FOR LIGHT JACKHAMER WORK

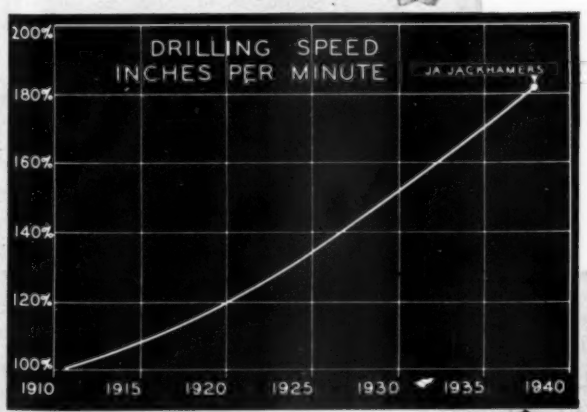
AN ADDITION TO THE ALREADY FAMOUS "JA" FAMILY

We announce a new 34½-pound Jackhamer known as the JA-35. It is the best machine for its weight that we have ever produced and does a surprising amount of work per cubic foot of air used. Miners, quarrymen, and contractors everywhere tell us that it fills a real need for a light-weight, sturdy machine that is powerful enough for general work yet light enough for cutting hitches, trimming, pop-holing, etc.

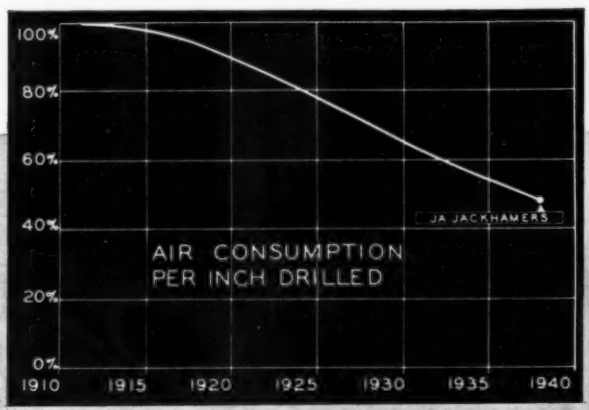
This new drill is styled after the famous JA-45 and JA-55 Jackhamers which have become so popular since their introduction last year. It fits perfectly into the JA Family which now has a Jackhamer for every class of work. The JA-30 for small, light jobs only; the JA-35 for general light Jackhamer work with an "extra-power" feature for heavier work; the JA-45 for the majority of general jobs; the JA-55 for all-around heavy work.

Why not give this new machine an immediate trial? Its fast drilling speed, and low air consumption, combined with its easy holding qualities will be a revelation to you. Consult our nearest office or dealer.

653-5



The generous recognition extended I-R drills for nearly three generations has made possible such tremendous improvements in drilling speed and economy as shown by the accompanying Jackhamer charts.



I-R products for mines, quarries, and contractors include all sizes and types of Rock Drills, Jackbits, Sharpeners, Drill Steel, Pumps, Hoists, Pneumatic Tools, Air Compressors, Engines, etc.

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Equipment You Ought to Know About

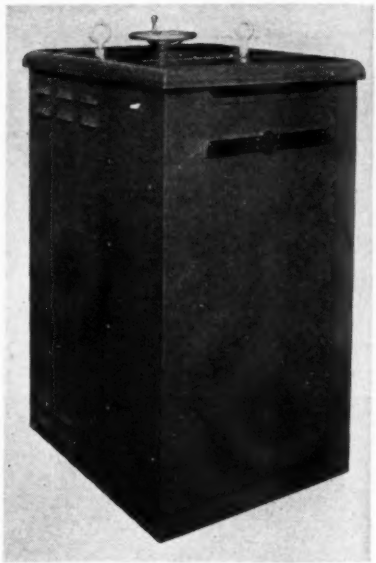
(*Continued from page 421*)

Hydraulic Control for Pavers

The Ransome Concrete Machinery Company, Dunellen, New Jersey, have devised a "finger tip" hydraulic control for concrete pavers. This hydraulic mechanism controls the boom swing, discharge chute, transfer chute, and water tank valves and is maintained by means of a simple oil pump driven off the engine transmission shaft. Many of the hydraulic controls may be automatically operated. Manufacturers claim this type of control as pertains to the boom swing gives a better control and smoother action of the hydraulically operated boom which has a swing of 170 degrees. The boom can be swung whether the mixing drum is revolving or not. Boom is locked when control valve is in neutral position. Available on single and dual drum pavers.

Hydrogen Welding Equipment

A new atomic-hydrogen arc-welding equipment, for the welding of special alloys and thin sections, has been announced by General Electric, Schenectady, New York. Manufacturer claims the equipment is particularly useful where a fusion weld is required as it produces a uniformly strong weld, free from porosity, and with a smooth appearance. Some common specific applications are: the building up of broken or worn sections of molds, tools and dies; the addition of a different metal for hard surfacing and other special requirements; and the welding of light-gauge stainless steel.



The new G-E equipment combines into a compact, portable unit, all the electric devices used with the process. Convenient terminals and pipe fittings allow ready connection to the electrode holder, to the power supply, and to the hydrogen source.

The drip-proof enclosure protects the equipment and the operator. Ventilation is provided by louvers at the ends. Lifting eyes facilitate transportation by crane. Roller-bearing wheels can be added to make the unit more easily portable.

Automatic Chain Drifter

An "Adjust-O-Feed" automatic chain drifter has recently been de-

"Hercules" (Red-Strand) Wire Rope offers more than the strength necessary for the most gruelling work, because we have learned from experience that more than strength is necessary.

We protect the strength built into "Hercules" (Red-Strand) with these other essentials — toughness . . . flexibility . . . durability . . . and elasticity — all kept in perfect balance. A method we have evolved during our eighty-one years of manufacturing experience.

In "Hercules" (Red-Strand) you always get ALL FIVE properly balanced for maximum performance. The wire rope of real economy.

For Maximum Efficiency in **Preformed** Wire Rope, Use . . .
PREFORMED "HERCULES" (Red-Strand) WIRE ROPE
Available in Both Round Strand and Flattened Strand Constructions

Made Only by **A. Leschen & Sons Rope Co.** Established 1857
5909 Kennerly Avenue, St. Louis, Missouri

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Denver ..... 1554 Wazee St.
Portland ..... 914 N. W. 14th Ave.
San Francisco ..... 520 4th St.
Seattle ..... 3410 First Ave., South

For your convenience in writing to A. Leschen & Sons Rope Co., you will find a card bound in this issue.

The S-D way is the LOW COST way

FOR FAST, FOOL-PROOF PERFORMANCE

S-D AUTOMATIC BOTTOM-DUMP TRAILERS

The large illustration above shows how strip mines are eliminating track expense and cutting haulage costs with Sanford-Day's "Automatic" Drop-Bottom Trailers. Glance at the close-up illustration of a 15 Ton S-D Trailer. What could be more simple in construction—more fool-proof in operation? Doors are tripped automatically as trailer reaches the hopper or storage bin . . . not "dumping" or "dropping" the coal, but "laying" it down gently, one door at a time, with a minimum of degradation. Doors are closed automatically by the simple movement of the trailer as it leaves the hopper . . . no manual operation of any kind . . . no valves . . . no complicated devices or "gadgets" to worry with or maintain.

For over 35 years Sanford-Day have been recognized nationally as leaders in the building of mine cars. As pioneers in manufacturing automatic drop-bottom cars, many exclusive features have been developed. These exclusive features have been adapted to the S-D Automatic Drop-Bottom Trailer, giving it the same simplicity and operating economy that characterizes the S-D Automatic car. For simple, fast, fool-proof performance, investigate S-D Trailers before you buy.

SANFORD-DAY IRON WORKS 600 Dale Ave., Knoxville, Tenn., U. S. A.

MINE CARS, ALL TYPES -:- TRAILERS -:- WHEELS -:- SHEAVES

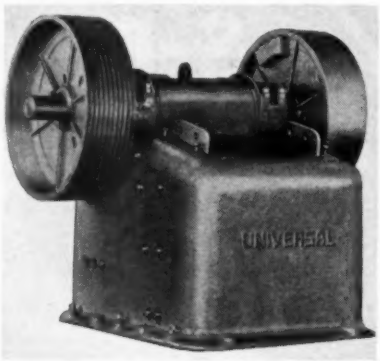
For your convenience in writing to Sanford-Day Iron Works, you will find a card bound in this issue.

signed by Sullivan Manufacturing Company, Claremont, New Hampshire. Manufacturers state, that because of the automatic drifter and adjustable feed features of the new product, the tool is highly

efficient when drilling in changeable rock. More complete information concerning the uses and features of the "Adjust-O-Feed" drifter may be obtained by writing the manufacturer.

"Streamlined" Crusher

The Universal Crusher Company, Cedar Rapids, Iowa, has introduced the new No. 2436 "Streamlined" crusher with 24"x 36" feed opening. This crusher has



a one-piece alloy steel base with a smooth exterior, reinforcement being provided on the inside. The new base construction provides saving in weight which effects savings in freight and provides for greater portability.

The entire base is flush at the bottom providing a firm footing, the bolt holes being on the same centers as ordinary models to allow for interchangeability. Other features include the six heavy duty roller bearings, two on the pitman and two on each side, quick acting product size adjustment and wide feed opening. All major parts are made to be interchangeable with regular models of Universal 24"x36" crushers.

They all laughed when I stepped up to the piano. They didn't know I was from the finance company.

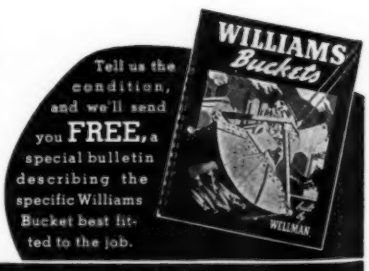
No "Dead-Head" Metal Rides in WILLIAMS *Buckets*

● **Williams Buckets don't rely on sheer mass and dead weight for digging power and stamina. Williams welded construction cuts down weight without sacrifice of power and durability.**

Williams power mechanisms give the bucket tremendous digging ability. They bite quickly and deeply to get full capacity loads—they work faster—get the job done quicker because you are moving dirt—not inert metal.

The Williams line includes Power-Arm, Multiple Rope, Power Wheel, Single Line Hook-On and Dragline Buckets.

Distributors located in all parts of the country are competent to render valuable field service.


Tell us the condition, and we'll send you FREE, a special bulletin describing the specific Williams Bucket best fitted to the job.
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Shots from the FIRING LINE

Shasta Dam Contract Awarded

The contract for the construction of the second largest dam in the world, Shasta Dam, on the Sacramento River, in California, has been awarded to Pacific Constructors, Inc., of Los Angeles, California, a syndicate of 12 construction firms, on their bid of $35,939,-450. Opening of bids was reported on page 382 of Excavating Engineer for July.

Shasta Dam will be the key structure of the great Central Valley Federal Reclamation Project, designed to adjust the water ills of an area 400 miles long and in places almost 100 miles wide.

Shasta Dam will be built about 14 miles north of Redding, California, and it will control the main stream of the Sacramento River through the creation of a reservoir with a capacity of 4,500,-000 acre-feet. Over 3,000,000 yards of earth and rock excavation will be required. The structure will be 560 feet tall, and 3,500 feet long, with a slightly curved axis. It will have an overflow spillway in the center, and a power plant with a capacity of 350,000 kilowatts will be built at its base. The mass of concrete to be placed in Shasta Dam will amount to 5,610,000 cubic yards.

The place of the Shasta Dam in the plan for the development of the Central Valley is that of a monitor on the Sacramento River, the principal water producer in interior California. This dam will regulate the flow of the river, making it possible to provide for the transportation of water into the San Joaquin Valley to supplement the irrigation supplies of large areas now faced with reversion to desert through exhaustion of the underground water on which they have depended. Through regulation of the river it will also serve to augment the stream flow in the summer months and thus to keep backed up in San Francisco Bay the salt water which now, from time to time, creeps upstream damaging the crops in the low-lying delta between Stockton and Suisun Bay. Shasta Dam also has been recognized as a navigation aid by the Congress, which authorized that $12,000,-000 of its cost be allocated to navigation.

Under the contract, work must begin on Shasta Dam within 30 days after the contractor has received notice to proceed, and must be completed in 2,000 calendar days—about 5½ years—thereafter. Before the notice to proceed can be issued, it will be necessary to complete, or virtually to complete, the Shoofly tunnel, which is now under construction at the dam site and through which the Southern Pacific main line railroad will be located temporarily while Shasta Dam is under construction. The Shoofly tunnel will serve as a temporary route for the railroad around the dam site while the permanent relocation of the railroad around the dam and reservoir is being made. When the permanent line is completed, the trains will be switched out of the Sacramento River Canyon and the Shoofly tunnel will then be used to divert the waters of the Sacramento River while the upper part of Shasta Dam is being constructed.

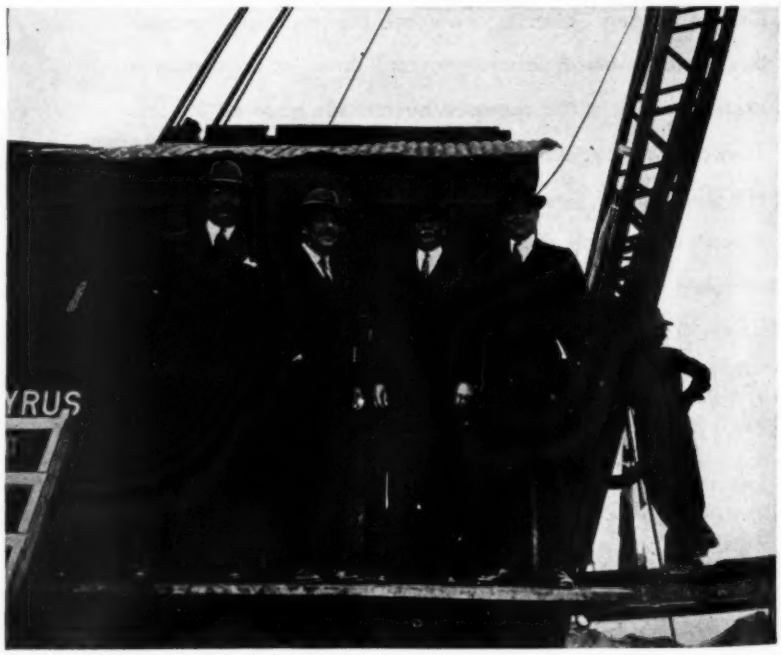
The Central Valley project was begun about 3 years ago. The contract for the construction of Shasta Dam, however, is the first covering a major structure to be awarded. Work to date has consisted of construction of camps, investigation of dam sites, and the construction of Contra Costa Canal, which will serve to provide a supplemental water supply for lands in Contra Costa County, between Walnut Creek and Martinez, and for industrial cities along Suisun Bay.

General Electric Lays Fair Cornerstone

Officials of the General Electric Company celebrated both the company's 60th year of existence and the beginning of construction on its building for the New York World's Fair 1939 today by driving a copper cachet 90 feet into the earth at Flushing, Long Island. The foot-long copper tube, containing a dedication, photographs of the fair grounds and model of the G-E building, and the list of those officiating and attending, served as a modern version of the conventional cornerstone-laying. It was sealed and attached to the bottom of the first pile to be driven on the building site. Owen D. Young, G-E board chairman, with the expert assistance of a regular crew, operated the pile driver which drove the dedicatory receptacle deep into the ground.

Grover Whalen, president of the Fair, and Charles W. Appleton, G-E vice president and chairman of the company's fair committee, assisted in the ceremonies. Luncheon was served afterwards in the administration building, with Mr. Young acting as host.

• This picture was taken at the driving of the first pile for the General Electric Building at the New York 1939 World's Fair. From left to right in the picture are: C. E. Wilson, General Electric Executive Vice President; Grover Whalen, President of the Fair Corporation; C. W. Appleton, General Electric Vice President; and Owen D. Young, Chairman of the Board of General Electric Company.

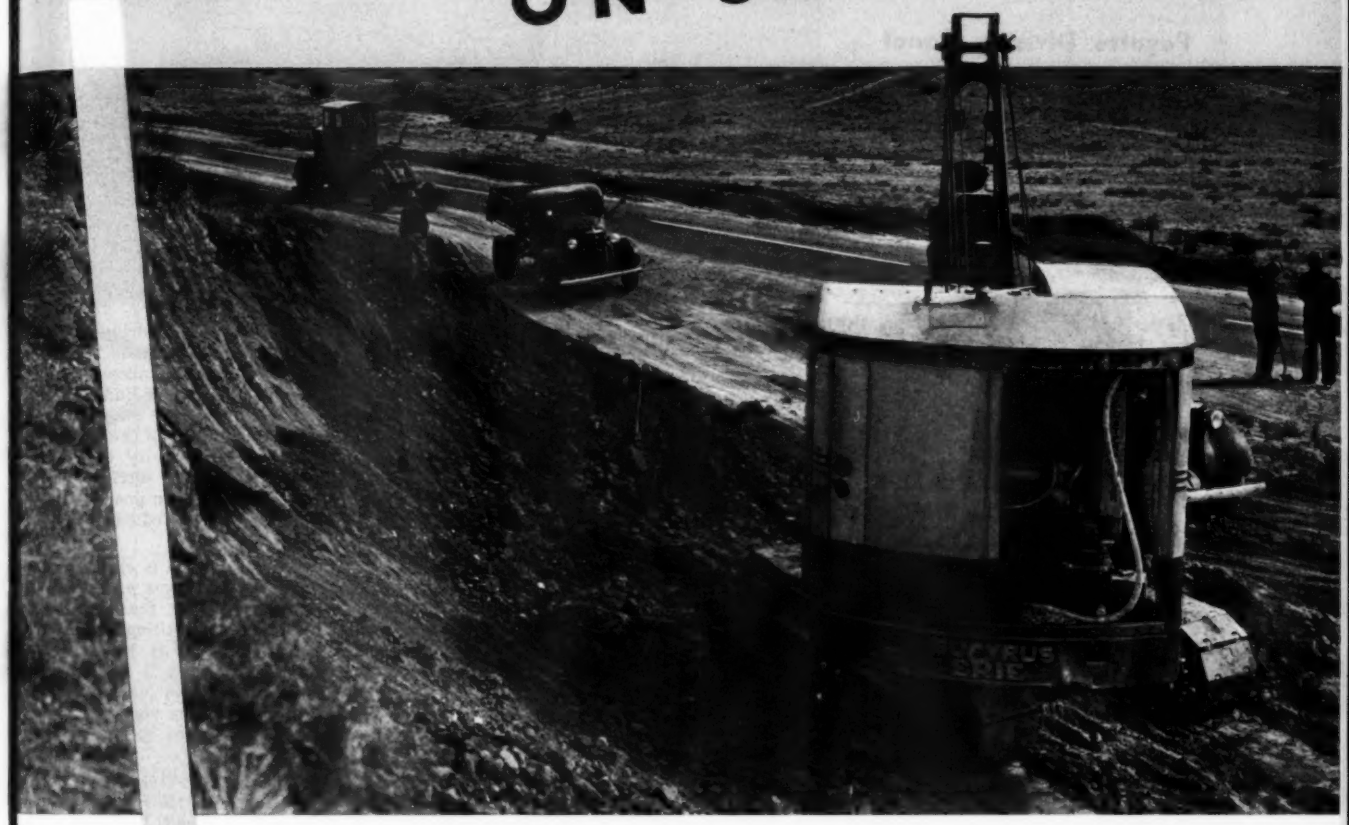


Pump Priming Starts Quickly

Following approval by the President of the relief and recovery bill, P.W.A. released funds for a great number of projects, most of which had been previously approved. Within three days after the signing of the bill, allotments totaling $225,567,930 were made for 1,776 non-Federal projects with a total estimated construction cost of $449,-815,298. Of the allotments, only $24,-282,500 were loans, the remainder being grants.

Total P.W.A. funds available are

DOUBLING-UP ON SAVINGS



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Here is an engine built to drive this shovel with a minimum of inexpensive fuel . . . a minimum of delay and cost for repairs . . . and with *lugging ability* to take the overload over the "hump" without wasted pick-up time!

No wonder it's so popular on roadwork. Yet the "Caterpillar" Diesel Auto Patrol is probably as much of a favorite! With its engine-weight directly over the driving-wheels, it has sufficient power and traction to blade, grade, scarify and handle oil-mix. It will make and maintain shoulders and ditches along concrete or dirt . . . put roads in shape for Winter . . . restore them when Spring comes. And — on all or any of that work — *it uses only about 2 gallons of Diesel fuel an hour!*

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$965,000,000, and applications for allotments must be made before September 30, for work that can be put under construction before January 1, 1939.

The $1,425,000,000 W.P.A. fund must be spent by February 28, 1939. Combined with rapid spending of these funds, recent release of Federal-Aid highway funds indicates a tremendous amount of excavating on construction work during the coming months.

Payette Division Canal Awards

Haas, Doughty & Jones and Marshall & Stacy Company of San Francisco, California, on its bid of $172,687, was awarded the contract for construction of almost 52 miles of secondary canals on the new Payette Division of the Boise Federal Reclamation Project near Boise, Idaho. The successful bid was the lowest of eight received and opened by the Bureau of Reclamation.

The contract involves construction of approximately 30 miles of the "A" line canal and 22 miles of the "D" line canal which branch from the end of the main Black Canyon Canal just west of Emmett, Idaho. It also involves construction of numerous canal structures, such as bridges, checks and turnouts, siphons and wasteways, and culverts along the canal sections covered by the contract.

The contractor must begin work within thirty days and has four hundred calendar days within which to complete the job.

The Black Canyon Canal is being constructed under several contracts already in force.

Concrete-Busting Shovel

Mountain States Construction Company, Eugene, Oregon, found an unusual use for the ¾-yard shovel on a recent Oregon road job. In modernizing an 1,100 foot stretch of 18-foot concrete road nine inches thick, it was necessary to break up and remove the old concrete.

Removing the dipper stick from their Bucyrus-Erie 10-B gas shovel, Mountain States Construction Company substituted a 3,000 pound, pile-driver-type, hammer, running in homemade timber guides, as illustrated in the accompanying picture. The hammer is hung by a single cable from one of the boom-point sheaves. On the driving trip the hitting force is supplied by gravity and the hammer itself, while the retract trip, which places the hammer in position for another blow, is accomplished by the hoist cable.

• Driscoll Construction Company of Pueblo, is building a new road between Saguache and Solida, Colorado. This Model FGC Cletrac, pulling a 12-foot-blade Adams grader, covers 2 miles per hour. In the background are the snow-capped peaks of the Sangre-de-Cristo mountains.

• Mountain States Construction Company cracked 150 linear feet of 18-foot-wide, 9-inch-thick concrete pavement per hour with this rig. The 3,000-pound hammer is operated by the shovel's hoist cable.

The wooden lead, which is chained to the top of the boom, serves as a track for the pile-driver. This feature prevents the hammer from falling over and breaking the cable after it has struck the pavement. In addition it makes operation easier, faster, and less destructive to the machine. This rig shattered 150 lineal feet of the old highway per hour.

After the complete stretch of concrete was broken up, the dipper and dipper stick were replaced. The machine then proceeded to load the broken concrete into Ford trucks which hauled it to an adjacent slope where it is used for riprap.

This stretch of Highway 99E, about two miles south of McMinnville, Oregon, was repaired for the Oregon State Highway Department by the Mountain States Construction Company. The new road will replace the old. The gravel road in the foreground of the picture, which has served as a detour, will be used as the shoulder and ditch line of the new concrete.

Coachella Canal Awarded

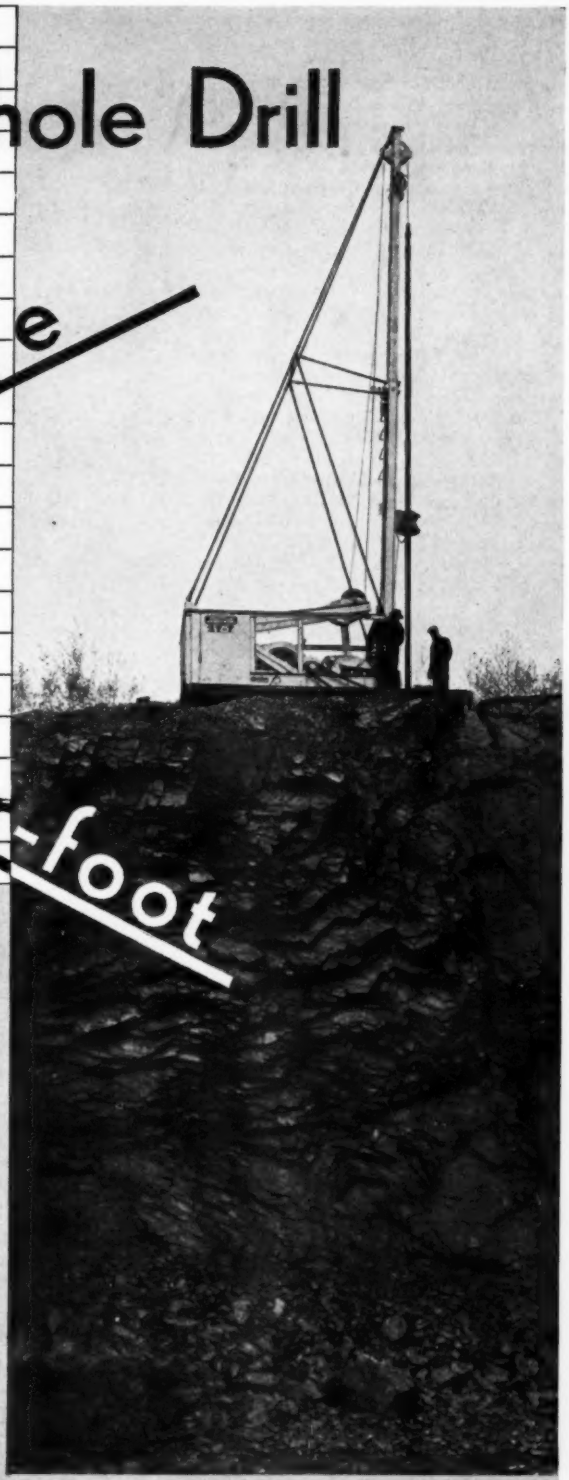
W. E. Callahan Construction Company and J. P. Shirley of Dallas, Texas, and Los Angeles, California, on their bid of $382,872, have been awarded the contract for the construction of the first 43 miles of the Coachella branch of the All-American Canal.

This was the lowest of 18 bids received and opened by the Bureau of Reclamation.

The Coachella branch eventually will

27-T Blast-hole Drill

Footage
Cost-per-foot



ON THE "range" in northern Michigan-Minnesota, a typical open pit mine last fall showed these production records with a Bucyrus-Armstrong 27-T blast-hole drill:

(1) —An average of 5 feet per hour of six-inch hole in hard rock, compared to 3 feet per hour with former drill rigs.

(2) —An operating cost of less than 27c per foot, compared to a former cost of 44c per foot.

These are SAVINGS that really mean something to open-pit mine and quarry operators who want to have a first-class blast-hole drill job done at LOWER COST. The 27-T is New and Modern . . . it is the product of the oldest and largest manufacturer in the field . . . it has been proven under the most difficult open-pit mining and quarry conditions.

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extend from its head on the All-American Canal just west of the sand hills in the East Mesa of the Imperial Valley to a point north of Salton Sea. The first section that is now being placed under construction extends from the head of the branch canal to a point near Niland, California. This section of the canal will have a maximum width at the bottom of 60 feet.

The All-American Canal itself is designed to replace the present Main Canal serving 500,000 acres now irrigated in the Imperial Valley. The present canal loops through Mexican territory for about 60 miles. The main section of the All-American Canal was begun in 1934 and will be completed and placed in use next year.

The Coachella branch is designed to serve more than 350,000 acres of arid lands, largely owned by the Government, which have not heretofore been irrigated. These lands lie in the section known as the East Mesa of the Imperial Valley between Holtville, California and Yuma, Arizona, and in the southern end of the Coachella Valley north of Salton Sea.

The All-American Canal project was authorized as a part of the Boulder Canyon project in 1928. This legislation also authorized the construction of Boulder Dam.

The new contract calls for the commencement of work within 30 days after receipt by the contractor of notice to proceed and for completion of this section of the canal within 750 calendar days.

• Geo. T. Krog is handling grading around the Museum of Science and Industry in Chicago's Jackson Park. The job calls for filling, grading and spreading black top soil. This view shows the company's Bucyrus-Erie bulldozer on an International TracTracTor doing final grading before placing of top soil.

Phosphate Mining License Grants Suspended

Paving the way toward formulation of a progressive program for prudent development of the Nation's phosphate fertilizer resources, Secretary of the Interior Harold L. Ickes ordered suspension until further notice of all activities in connection with the granting of phosphate mining leases on the public domain involving primarily 2,000,000 acres in Florida, Idaho, Montana, Utah, and Wyoming.

While the order will not affect leases already in existence, it was explained that no further phosphate mining leases will be granted on the public lands, until Congress decides upon a policy to be pursued in bringing about protection of the phosphate lands and development of the product so valuable to American agriculture.

Acting in response to a special message from President Roosevelt, on May 29th, a joint congressional committee now is engaged in an investigation of the phosphate situation, under instructions to submit its findings at the next session of Congress.

In directing Commissioner Fred W. Johnson, of the General Land Office, to suspend all phosphate mining lease operations for the present, Secretary Ickes explained that continual drain upon the privately owned supply of the fertilizer material in Tennessee and Florida, rendered imperative the move for protection and development of the phosphate-bearing land on the public domain in the West.

Should the present private supply become seriously depleted, it will be necessary for eastern agricultural sections to draw upon the 5,000,000,000 ton reserve of the valuable fertilizer on the public lands in the West, to replenish the soil for raising the farm products of the Nation.

"Caterpillar" Prices Reduced

Making its most important and boldest forward step since its introduction of Diesel-powered tractors in 1931, Caterpillar Tractor Co. announced on June 20, 1938, liberal price reductions in its line of track-type tractors and Diesel engines. The reductions in the tractor line affect all sizes except the Twenty-Two, the price of which had already been reduced $200 several weeks earlier. The acclaim with which that announcement was received encouraged

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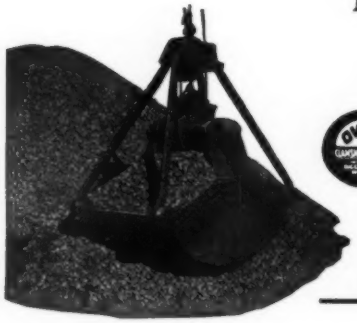

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Specify EXCELLAY Preformed Wire Rope and get greater value for your money. Our engineers will be glad to cooperate with you.

You can depend upon the wire rope on the Yellow Reel

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UNITED STATES STEEL

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the Company to make similar reductions in the prices of other of its products, the reductions ranging from $150 to $650 on the several sizes of tractors and from $175 to $750 on the Diesel engine line, affecting six of the eight current sizes of "Caterpillar" Diesel Engines.

1937 Mining in Alaska

Mines in Alaska produced minerals worth $26,989,000 in 1937, as against $23,594,000 in 1936, according to an announcement made by the United States Department of the Interior through the Geological Survey. The total value of the mineral output of the Territory since 1880 is $749,211,000, or more than one hundred times the price paid to Russia for the entire Territory at the time of purchase in 1867.

The following table shows in summary form the mineral output of Alaska for 1937 and, for comparison, the production of the same minerals in 1936:

Value of mineral output of Alaska in 1937 and 1936

	1937	1936
Gold	$20,373,000	$18,433,000
Silver	384,000	369,000
Copper	4,741,000	3,720,000
Lead	120,400	99,500
Platinum metals	397,600	241,900
Tin, metallic	202,300	105,000
Coal	552,700	573,700
Miscellaneous mineral products, including antimony, limestone, quicksilver, etc.	218,000	51,900
	$26,989,000	$23,594,000

In all the computations of value the average selling prices for the year have been used rather than the prices actually received by the producers. Furthermore, the quantities mentioned in this statement relate to production and not to sales, shipments, or some other perhaps equally significant basis by which the industry might be gaged.

Seminoe Dam Progress

Storage of water back of Seminoe Dam will be begun next winter, and the first 35,000-acre unit of the Kendrick Federal reclamation project should be completed in 1940, according to John C. Page, Commissioner of Reclamation.

The Kendrick project consists of Seminoe Dam on the North Platte River which will store more than a million acre-feet of water, Seminoe power plant, the Alcova diversion dam, Casper canal, and the distribution system to serve about 35,000 acres of arid land in the vicinity of Casper, Wyoming.

The two dams of the Kendrick project bracket the famous Pathfinder Dam, the major engineering feature of the North Platte project, which was completed by the Bureau of Reclamation in 1909. These three, the old and new, will form a series on the North Platte upstream from Casper which will completely regulate that stream, withholding all the flood waters for irrigation and making it possible to use the surplus in the generation of hydroelectric power at Seminoe Dam, the first of the three.

Alcova dam, an earth embankment 256 feet high, already has been completed and is in use. When the Casper canal has been completed, Alcova dam will serve as the diversion structure which will raise the water of the North Platte to sufficient height to supply the canal.

The Casper canal, 60 miles long, is 90 percent completed. Six tunnels of a total length of 17,521 feet have been completed, and good progress is being made on the excavation of the remainder of the canal.

Seminoe Dam, a 300-foot high concrete arch, is under construction in the canyon 75 miles southeast of Casper, and it is anticipated that the dam can be completed by December 1. The river was diverted through a tunnel around the dam site in August last year, and the excavation for the dam foundation was completed in January when concrete operations began. Since January 35 per cent of the concrete required for this dam has been placed.

Flood Control Allotments

The Secretary of War has approved the following allotments from the War Department Civil Appropriation Act of 1939, for continuation or completion of work on flood control projects authorized by the Omnibus Act of 1936. This allocation totals only $60,746,866, leaving approximately $12,000,000 to be allocated at a later date.

Project	Allotment
Merrimack River Basin	$ 150,000
Connecticut River Basin, Vt., N. H., Mass., and Conn.	315,000
Examinations & Surveys—Providence District	37,000
Southern N. Y. Projects (Binghamton Area)	5,950,000
Examinations & Surveys—New York District	51,500
Wilkes-Barre & Hanover Twp., Susquehanna River, Pa.	2,065,500
Kingston-Edwardsville, Susquehanna River, Pa.	1,204,500
Examinations & Surveys—Baltimore District	73,200
Moorefield, Moorefield River, W. Va.	90,000
Examinations & Surveys—Washington District	100,000
Augusta, Savannah River, Ga.	200,000
Examinations & Surveys—Savannah District	22,200
Examinations & Surveys—Norfolk District	135,000
Examinations & Surveys—Charleston District	52,000
Examinations & Surveys—Jacksonville District	5,000

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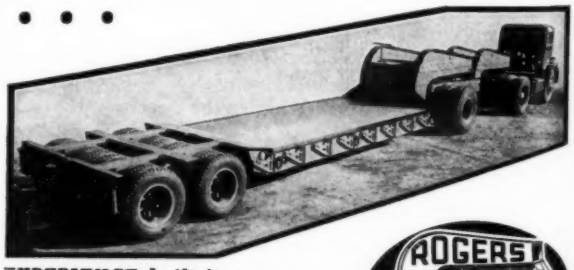

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Examinations & Surveys—Pittsburgh District	250,000
Huntington, Ohio River Basin, W. Va.	2,434,000
Ceredo, Ohio River Basin, W. Va.	1,114,000
Kenova, Ohio River Basin, W. Va.	1,707,000
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Ironton, Ohio River Basin, Ohio	1,280,000
Examinations & Surveys—Cincinnati District	111,600
Evansville, Ohio River Basin, Ind.	648,000
Paducah, Ohio River Basin, Ky.	820,000
Harrisburg, Ohio River Basin, Ill.	440,000
Tell City, Ohio River Basin, Ind.	900,000
Golconda, Ohio River Basin, Ill.	260,000
Cannelton, Ohio River Basin, Ind.	540,000
Brookport, Ohio River Basin, Ill.	560,000
Brevoort Levee, Wabash River, Ind.	386,000
Indianapolis, Fall Creek Levee, Ind.	500,000
Muncie, Flood Wall & Channel Improvement, Ind.	450,000
Lyford Levee Unit, Wabash River, Ind.	200,000
Gill Township Levee Unit, Wabash River, Ind.	315,000
Examinations & Surveys—Louisville District	15,000
Middlesboro, Cumberland River, Ky.	161,540
Examinations & Surveys—Nashville District	62,500
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Saline Point Cut-off, La.	104,700
Big Black River, Miss.	227,500
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Examinations & Surveys—Vicksburg District	120,000
Conchas Dam & Reservoir, N. M.	5,400,000
North Little Rock to Gillette, (Above Plum Bayou), Ark.	520,000
Village Creek, White River, Ark.	383,100
Poplar Bluff to Knobel, Levee, Ark.	714,610
Fort Supply Reservoir, Okla.	900,000
Great Salt Plains Reservoir, Okla.	930,000
Caddoa Reservoir, Arkansas River, Colo.	150,000
Examinations & Surveys—Little Rock District	220,000
Diking Dist. No. 1 & 3, and Little Island Dist., Columbia River Basin, Wahkiakum Co., Wash.	228,000
Willamette River, Willamette River Basin, Oregon	554,000
Examinations & Surveys—Portland District	60,900
Mud Mt. Dam, White River, Wash.	1,350,000
Lowell Creek, Alaska	197,000
Examinations & Surveys — Seattle District	120,500
Examinations & Surveys—Bonneville District	19,800
Ballona Creek Jetties, Los Angeles Co. Drainage Area, Calif.	125,000
Compton Creek, Los Angeles Co. Drainage Area, (Above Greenleaf Ave.) Calif.	450,000
Hansen Retarding Dam, Los Angeles Co. Drainage Area, Calif.	2,000,000
Los Angeles River, Mariposa to Downey Rd., Los Angeles Co. Drainage Area, Calif.	7,825,000
Van Nuys Retarding Dam, Los Angeles Co. Drainage Area, Calif.	200,000
Santa Fe Retarding Dam, Calif.	100,000
Prado Dam, Santa Ana River, Calif.	2,125,000
Examinations & Surveys—Los Angeles District	87,800
Examinations & Surveys — Sacramento District	65,000
Examinations & Surveys—San Francisco District	32,600
Examinations & Surveys—Buffalo District	49,200
Examinations & Surveys—Detroit District	47,000
Examinations & Surveys—Milwaukee District	12,000
Topeka, Kansas River, Kansas	140,000
Examinations & Surveys—Kansas City District	34,400
Examinations & Surveys—Omaha District	98,000
Office, Chief of Engineers	100,000
Snagging under authority of Section 2 of Flood Control Act approved August 28, 1937	300,000
Henderson Co. Drainage District No. 3, Upper Mississippi River, Ill.	2,570
Gregory Drainage District, Upper Mississippi River, Mo.	3,500
Fabius River Drainage District, Upper Mississippi River, Mo.	6,000
South Quincy Levee & Drainage District, Upper Mississippi River, Ill.	8,230
Sny Island Levee District, Upper Mississippi River, Ill.	6,850
Penny Slough, Rock River, Ill.	15,000
Total	$60,746,866

Safety Survey

Safety laws and orders of eleven Western States are the subject of a survey to be made by a new W.P.A. project at a cost of $10,000. This project, just approved by the Federal government at Washington, will be directed by C. H. Fry, Chief of the Industrial

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T-19

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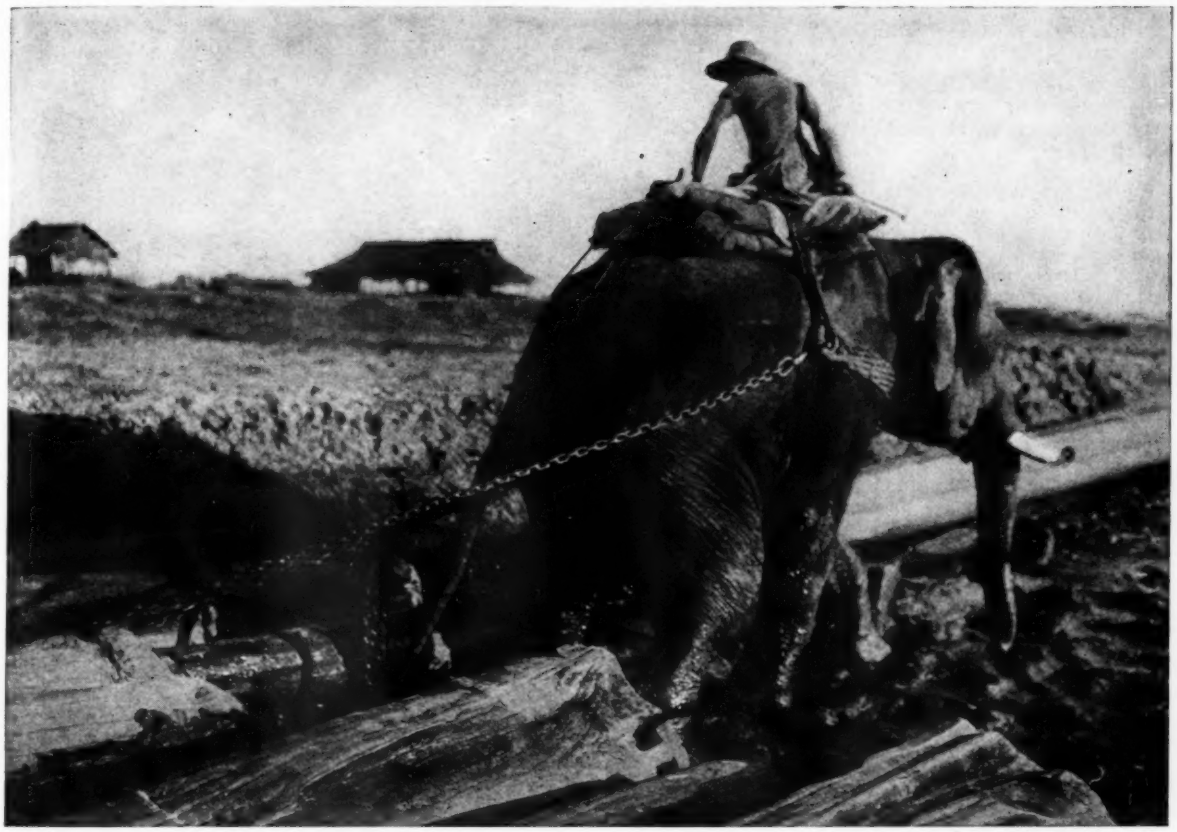
Lugs like an Atlas Diesel!



— by Ewing Galloway, N. Y.

Atlas Diesel Engines and elephants have a lot in common. When the going is tough, they both throw all they've got into the collar and lug through. You never heard of elephants or Atlas Diesels being stopped.

You'll get slow speed, dependable power, for years and years from both elephants and Atlas Diesel Engines —but from what we've heard about an elephant's daily menu, we know Atlas Diesel power is much more economical.

While you couldn't use an elephant for powering a shovel or dragline, it's the natural, practical, sensible, place for an Atlas Diesel Engine that will buckle down and give you the same powerful, steady pull as the elephant shown above.

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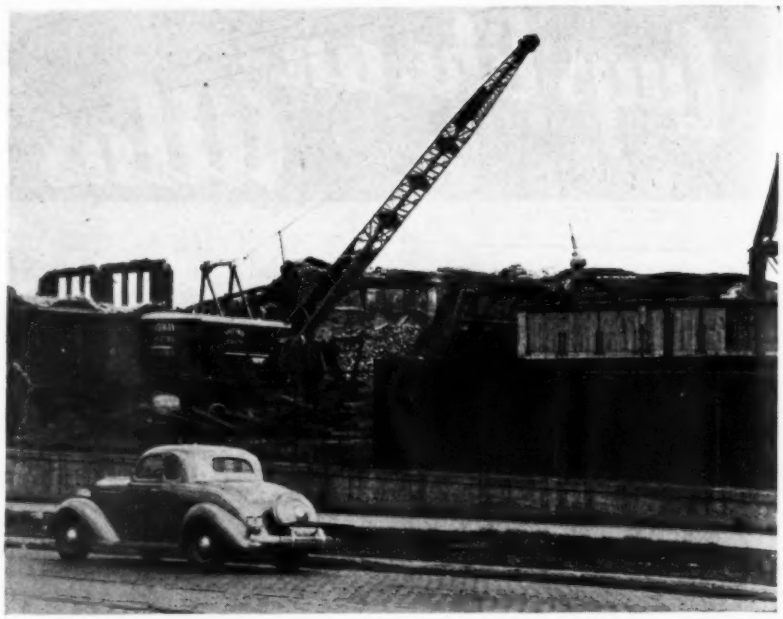

• Speedway Excavating and Crane Service had the contract for wrecking all buildings at the American Manganese Steel Co. property, 95th & Cottage Grove Avenue, Chicago. The job involved handling over 1500 tons of steel and iron, and thousands of yards of concrete, brick and debris. Speedway's 37-B, swinging a 6800-pound skull-cracker demolished the structures. Then the same rig, with shovel front-end loaded the rubbish to trucks.

Accident Commission of California, and Interim Chairman of the Western Safety Conference to be held in Los Angeles, September 12-16.

Under the provisions of the project, 27 experienced safety engineers and attorneys will unite in re-codifying all safety laws and orders for the prevention of accidents in traffic, the home and in industrial vocations.

Aiding in the movement are the states of California, Oregon, Washington, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, Arizona, New Mexico, which are subjects of the survey, as well as British Columbia, Alaska, Hawaii and Lower California.

Uniform safety laws have long been the dream of safety engineers and others interested in a lowering of the terrific loss of life from all public and industrial causes. Plans have been made for a series of conferences at the Western Safety Conference which are expected to have a far-reaching effect.

It is expected that the conclusions reached by the several thousand safety experts attending the conference will be of great value in the deliberations of the experts making the survey, many of whom will take part in the conference.

Industrial accidents will receive special consideration as will traffic hazards caused by the difference in the traffic laws of the several states. This phase of accident prevention is of special importance to states visited annually by thousands of tourists.

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(taken from page 445)

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Earth Engineering

(*Continued from page 417*)

tageous effect upon permeability, consolidation and stability of earth structures.

Second, investigations relative to the mechanics of test procedure and interpretation of data, such as time of consolidation required for shear tests, rate of shearing, methods of compaction, and the effect of rock larger than ¼-inch on permeability, consolidation, stability and so forth.

As the Bureau's work has gone forward, certain definite trends in embankment construction have become apparent. Some of these are: to utilize in the structure, by proper placement and blending, all materials that must be excavated on the job; irrigation of borrow pits; use of heavier rolling or compacting equipment; careful control of densification and placement moisture conditions; a general tendency to use a material of a less clayey nature than formerly; detailed layout of borrow pits from the equipment and materials standpoints, based on physical properties tests.

Bureau engineers believe that scientific earth materials control is leading to more effective construction procedure and to longer life and greater stability in the structures.

Equipment

The soils laboratories occupy a suite of rooms in the basement of the Customhouse in Denver, adjacent to other experimental units of the Bureau.

Probably the most spectacular piece of machinery in the soils section is the hydraulic press for making shear tests. This is one of the largest machines used anywhere for this purpose. It can shear a specimen of soil over a square-foot surface, applying 30,000 pounds in both normal and shear loads if necessary.

Another large-size hydraulic press is equipped with a ram similar in size and shape to the "foot" of a sheeps-foot roller, and pressures equal to those produced by the biggest rollers may be applied to large soil samples.

The percolation and consolidation apparatus is elaborate and housed in a separate room. Some of the remaining equipment includes: a small shear machine for shearing undisturbed samples from foundations, thermostatically controlled drying ovens, equipment for Atterberg's relative plasticity tests, hydrometers for minus 200-mesh size analysis, expansion and shrinkage equipment for soils mechanics investigations, testing sieves and supplementary equipment, specific gravity flasks, apparatus for the Proctor compaction tests, penetration resistance equipment, and miscellaneous laboratory apparatus.

Organization

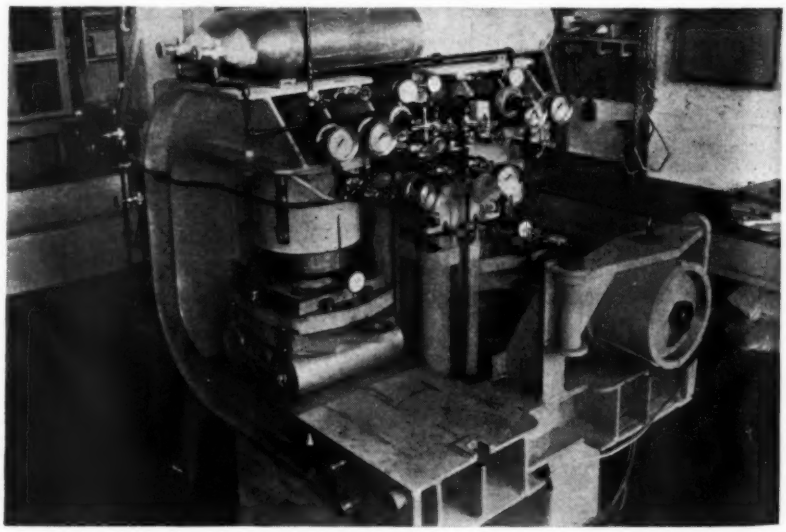
The earth materials laboratories, directed by L. W. Hamilton, associate engineer, have a basic personnel of eight engineers and two laborers. During the winter months men are brought into the Denver office from the field, so the crew may swell to as many as 22 engineers and five laborers as it did in the winter of 1936-37. In the past three years approximately 60 engineers have worked in these soils laboratories, which is numerical evidence of how thoroughly the Bureau believes in training its field men in laboratory procedure.

Arthur Ruettgers, senior engineer, and R. F. Blanks, engineer, direct the Division of Materials, Control and Testing, which is divided into the following sections: Concrete and Metals, Cement and Paint, Earth Materials, Hydraulic Models, Pumps and Turbines, Equipment and Supplies, and Specifications and Reports.

The section on earth dam design, under the immediate direction of F. F. Smith, senior engineer, is supervised by K. B. Keener, civil engineer on design of dams.

All Bureau engineering and construction are supervised by R. F. Walter, chief engineer, and the design and research work are directed by J. L. Savage, chief designing engineer. The Bureau of Reclamation, with John C. Page as commissioner, is a unit of the Department of the Interior.

The writer is indebted to engineers of the Bureau of Reclamation at Denver for cooperating in the preparation of this article and to Mr. L. W. Hamilton, associate engineer in charge of the earth materials laboratory, for providing detailed information.



• This shear machine, one of the largest in the world, can exert a pressure of 30,000 pounds in both normal and shearing load, and can measure deflections and consolidation to one-thousandth of an inch.

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Trade notes

R. B. Whyte, general superintendent of the Macwhyte Company plant, Kenosha, Wisconsin had Macwhyte engineers act as personal guides to more than 60 members of the Wisconsin State Association of Power Engineers who were shown, as well as told, what happens in the making of wire rope, from the first laboratory tests of wire rods through the many processes leading to the finished product.

The Alban Tractor Company of 725-27 East 25th Street, Baltimore, have been appointed distributors for Haiss Clamshell Buckets in the State of Maryland and the District of Columbia. They will carry a stock of buckets and repair parts in Baltimore for prompt shipment.

Willson Products, Inc., Reading, Pa., manufacturers of goggles, helmets and respiratory protective devices for dust hazards, have just completed a half million dollar plant building program, in order to take care of expanding business. The firm, founded in 1870 by the late T. A. Willson specializes in the manufacture and development of industrial safety devices.

The Atlas Imperial Diesel Engine Co. of Oakland, California, has recently opened its Central Division Sales Office in the Builders Exchange,- 228 North LaSalle Street, Chicago, Illinois, according to an announcement by F. H. Kilberry, president of the concern.

F. H. Dickson, formerly manager of the Diesel Division of Fairbanks, Morse Company, will be in charge of sales of the company's regular line of marine, stationary, industrial and oil field Diesels and will be assisted by A. H. Braunsdorff and A. A. Bauer, formerly connected with the sales department of the Atlas Eastern Factory at Mattoon, Illinois.

Book reviews

Maximum and rated performance curves of the seven current sizes of "Caterpillar" Diesel Engines are included in a new booklet issued by Caterpillar Tractor Company, Peoria, Illinois

Printed in three colors, the book is a brief resume of the features of the Diesel engine, as manufactured by Caterpillar. Mechanical features of the engines, as well as a discussion of materials used in the construction, are also given.

The Austin-Western Road Machinery Company, Aurora, Illinois, has published a four-page folder describing and illustrating the Austin-Western three-wheeled model elevating grader, which has recently been placed upon the market. Complete specifications of the unit are given. Readers may obtain their copy by writing the manufacturer.

The Universal Crusher Company, Cedar Rapids, Iowa has issued Bulletin 800 covering the "Chip-top" Spreadroller recently introduced by them.

The bulletin graphically illustrates the operation of the Spreaderoller, showing how it applies seal coat to freshly oiled roads and streets, applying the large material first, the medium next, and the fines on top; and rolling them smooth immediately after depositing them, providing a white-topped, visible, skid-proof surface.

Readers may obtain their copy by writing the manufacturer.

A folder describing and illustrating the alternating current brake-motor, rated to 50 pounds-feet torque, manufactured by General Electric, Schenectady, New York, has recently been published. The folder gives the advantages, uses, and specifications of the motor. Readers may obtain their copy by writing the manufacturer and requesting booklet GEA-2026A.

Dams, control works and special engineering investigations of the Bureau of Reclamation are described in detail in a new book entitled "Dams and Control Works" published by the Department of the Interior. Chapters are devoted to the design, and the construction of such outstanding structures as Boulder, Grand Coulee, and Imperial Dams, and special articles written by experts of the Bureau of Reclamation staff are devoted to the design and improvement of dams and control works in which the Bureau has had a large part.

The first edition of Dams and Control Works was published in 1929. The second edition contains much new material, bringing up to date information on the progress of dam construction and presenting for the first time in handy form the results of the studies made in the Bureau's various laboratories.

The new book will be sold at $1 a copy. It may be obtained by writing to the Bureau of Reclamation, Washington, D. C.

A new catalog, describing and illustrating the outstanding features of Rex Moto-Mixers and Moto-Agitators, has been published by the Chain Belt Company, Milwaukee. Construction details and complete specifications for the machines are given. Readers may obtain their copies by writing the manufacturer.

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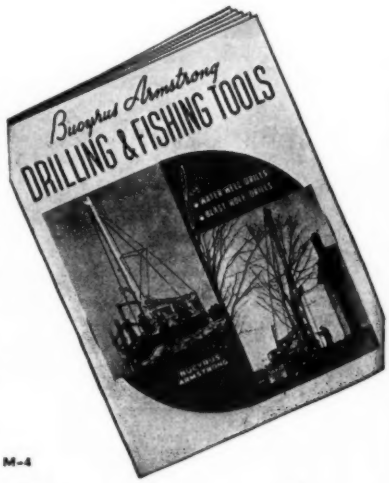

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EXCAVATING, DRILLING & MATERIAL HANDLING EQUIPMENT • • SOUTH MILWAUKEE, WIS

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For Sale: 1-yard Bucyrus-Erie gas shovel, Oklahoma; 1-yard McMyler gas shovel, Kansas; 2 2-yard, 50-B Bucyrus shovels, steam, Oklahoma; 1 9-yard, electric, Arkansas, all on leases; 25 motors, 25 cycle, 1 to 150 hp. at $4.00 per hp.
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TRUCK CRANES and SHOVELS

UNIVERSAL GAS TRUCK CRANE. Full revolving. 20' boom. ⅝-yard Kiesler clamshell bucket with teeth. 4-wheel Mack truck. 4-cylinder 4¾"x6½" engine. Good operating condition. Located Chicago. Box 2071-SCC.

UNIVERSAL—THEW Model AC-35, ½-yard gasoline truck crane. 28' boom. ½-yd. Owens digging bucket. Mack truck equipped with dual hard tires rear and pneumatic tires front. Condition good. Located Central New York State. Box 1193-SCC.

SMALL SHOVELS
Under 2 Yards

⅜-YARD

UNIVERSAL—(UNIT) MODEL B ⅜-yd. shovel —¾ swing. Fordson Tractor Power unit. Good condition except minor repairs needed. Located Indiana. Box 2117-SS

½-YARD

BUCYRUS-ERIE — TYPE A. ½-yard steam shovel. Cat mounted. 26' boom clamshell equipment. Located Central Illinois. Box 2007-SS.

MEAD MORRISON ½-yard Gas Shovel and 35' boom dragline including ½-yd. Page drag bucket. Good operating condition. Located Minnesota. Box 2081-SS.

P & H—MODEL 300—½-yard gasoline shovel. Reconditioned. Located Kentucky. Box 1107-SS.

⅝-YARD

BUCYRUS-ERIE TYPE AA ⅝-yard Air Tunnel shovel cat. mounted. Two speeds. Will work in 14' clearance. Reconditioned. Excellent condition. Located New York. Box 2180-SS

BYERS MODEL 128. ⅝-yd. gas shovel and 35' boom dragline, including ½-yd. Page "C" drag bucket. 4-cylinder Diamond T engine. Engine overhauled 1937. Good operating condition. Located Illinois. Box 2087-SS.

GENERAL—⅝-yd. Gas shovel. Good condition. Located Eastern Pennsylvania. Box-2104-SS.

¾-YARD

BUCYRUS-ERIE 1030 Gas ¾-yard rope crowd shovel and 40' boom dragline. Located Texas. Box 2175-SS

BUCYRUS-ERIE TYPE B ¾-yd. Caterpillar mounted steam shovel. Located Massachusetts. Box 2123-SS

BUCYRUS-ERIE TYPE B Steam Shovel. ¾-yard Quarry dipper. Cat mounted. New boiler installed late 1935. Good operating condition. Located Georgia. Box 2073-SS.

BUCYRUS-ERIE — TYPE B. ¾-yard steam shovel and 40' boom clamshell. Cat. mounted. Located Buffalo, New York. Box 2005-SS.

BUCYRUS-ERIE—TYPE B ¾ YD. Caterpillar mounted Extra high-lift steam shovel. Located Chicago. Good working order. Will rent or sell. Box 1100-SS.

BUCYRUS-ERIE TYPE B steam ¾-yard shovel and 36' boom clamshell, including ¾-yard Williams clamshell bucket. Located Central New York. Box 1188-SS.

LORAIN MODEL 40—¾-yd. Gas shovel. 16 mo. old. Excellent condition. Located Eastern Pennsylvania. Box 2103-SS.

NORTHWEST MODEL 105 Combination shovel and clamshell. 24' shovel boom. 17½' dipper handle. ¾-yard dipper. 40' clamshell boom. Type "C" Lakewood 1-yard clamshell bucket. Twin City gasoline engine. Reasonably good condition. Located near Chicago. Box 2045-SS.

OSGOOD. COMMANDER. Combination shovel, dragline and clamshell. ¾-yard Rock Type dipper. 35' dragline and clamshell boom. ¾-yard Page drag bucket. Hercules 6-cylinder 4½"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SS.

⅞-YARD

BUCYRUS-ERIE B-2 High Lift steam shovel. Armored rear-end cab. Single Shaft cat. Located Massachusetts. Box 2174-SS

BUCYRUS-ERIE B-2. Extra High Lift shovel. 21'3" boom. 18'4" dipper handle. ⅞-yard dipper. Well cared for. Good condition. Located Rhode Island. Box 2047-SS.

BUCYRUS-ERIE B-2 High Lift Steam Shovel. Single Shaft Cat. Exceptionally good condition. Located Connecticut. Box 2078-SS.

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South Milwaukee, Wisconsin

BUCYRUS-ERIE—1035 GASOLINE SHOVEL. Chain Crowd. ⅞-yard Dipper. 26-in. caterpillar treads. Electric starter. Needs some repairs. Located vicinity Boston. Box 1065-SS.

BUCYRUS-ERIE—B-2—HIGH LIFT Caterpillar Mounted Steam Shovel. Good Operating condition. Located Eastern Pennsylvania. Box 1019-SS.

BUCYRUS-ERIE—B-2—HIGH LIFT STEAM shovel. 21'3" boom, 16' dipper handle, ⅞-yard dipper. Single shaft caterpillar. Located Vermont. Box 1135-SS.

1-YARD

BUCYRUS-ERIE 32-B—Gasoline chain crowd 1-yard shovel. Electric starter. Single shaft cats. Wisconsin 6-cylinder 5"x6" engine. Few minor repairs needed. Otherwise excellent condition. Located near Boston. Box 2061-SS.

BUCYRUS-ERIE—D-2 1 yard Diesel Shovel. Atlas engine. Field reconditioned. Located North Carolina. Box 1079-SS.

BUCYRUS-ERIE 1030 — ELECTRIC TUNNEL shovel. Boom 10 ft. 7 in. Dipper handle 10 ft. 5 in. 1-yd. dipper. Boom hoist 5 ft. 6 in. rear end clearance. 2 motor—power supply 3 phase, 60 cycle, 440 volt. Located Virginia. Box 1068-SS.

BUCYRUS-ERIE 31-B — 1 YARD STEAM shovel. Located Lawrence, Mass. Make an offer. Box 1092-SS.

BUCYRUS-ERIE 31-B — 1 YARD STEAM SHOVEL. Located Tennessee. Box 1093-SS.

BUCYRUS-ERIE — GA-2 — GAS-AIR — extra high lift shovel, 24' boom, 16' dipper handle, 1-yard dipper. Air starter. Mass. air tanks. Single shaft caterpillar. Located Massachusetts. Box 1121-SS.

BUCYRUS-ERIE—31-B STEAM SHOVEL. 22' boom, 15' dipper handle, 1-yard dipper. Now operating, can be demonstrated. Located Alabama. Box 1130-SS.

LORAIN—MODEL 60—1-YARD shovel. Located Southern Virginia. Box 1182-SS

MARION MODEL 7, 1-yard steam shovel. Has not operated in the past five years. New flues recently installed in boiler. Located Buffalo, New York. Box 2006-SS.

NORTHWEST — MODEL 105 — GASOLINE shovel and clamshell—1-yard. Located Massachusetts. Box 1123-SS.

P&H MODEL 600 1-yd. Gasoline shovel. Waukesha engine. Crane equipment also available. Good condition. Located Connecticut. Box 2113-SS

P&H MODEL 600A Gas 1-yard Shovel and 40' boom crane. Electric starter and lights. Waukesha 4 cylinder 6"x7" Model J. L. engine. $1500 recently spent overhauling. Good condition and appearance. Located Central Wisconsin. Box 2084-SS.

P. & H. MODEL 600—1-YARD GAS SHOVEL and 40' boom clamshell. Waukesha JL-6"x7" Engine. Located North Carolina. Box 1095-SS.

1¼-YARD

BUCYRUS-ERIE 34-B Diesel combination 1¼-yard shovel and 45' boom dragline including 1½-yard drag bucket and Kohler light plant. 30" cat. treads. Caterpillar D-11,000 engine. Used only about 8 months. Excellent condition and appearance. Located Kansas. Box 2172-SS

BUCYRUS-ERIE GA-3 Gas-Air 1¼ yard shovel. Single shaft cat. Electric starter. Waukesha 4-cylinder 6¼"x8" engine. First class condition. Located near St. Louis. Box 2162-SS.

BUCYRUS-ERIE 34-B Diesel Chain crowd shovel. Special 1½-yd. dipper. Caterpillar Diesel D-11,000 6 cylinder 6¼"x8" engine. 30" cat. treads. Wired for electric lights. Excellent condition. Located Chicago. Box 2129-SS

BUCYRUS-ERIE GA-2 Gas-Air shovel. Single shaft cat. Waukesha 6¼"x8" 4-cylinder engine. $3,000 repairs added June 1937. Excellent condition. Located Kansas. Box 2126-SS

BUCYRUS-ERIE GA-2 Gas-Air 1¼-yd. shovel. Waukesha 6¼"x8" 4-cylinder engine. Electric starter. Some spare parts available. Good operating condition. Located Eastern Pennsylvania. Box 2124-SS

BUCYRUS-ERIE GA-3 Gas Air 1¼-yd. shovel. Waukesha 4-cylinder 6¾"x8" engine. Good operating condition. Now operating Arizona. Box 2090-SS.

BUCYRUS-ERIE GA-2 Gas-Air 1¼-yd. shovel. Waukesha 6½"x8" engine. Single shaft cat. General appearance and condition good. Located North Carolina. Box 2108-SS.

FOR SALE

Address all box numbers c/o EXCAVATING engineer . . . . . at South Milwaukee, Wisconsin

SMALL SHOVELS
Under 2 Yards continued

BUCYRUS-ERIE. GA-2, Gas-Air. 1¼-yard shovel. Electric starter. Waukesha W.L. 4-cylinder 6¼"x8" engine. Single shaft cat. Extensively repaired recently. Located Texas. Box 2030-SS.

BUCYRUS-ERIE E-2 shovel and dragline. 1½-yard Plate dipper. 45' boom plus 10' extension. 1¼-yard Page drag bucket. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SS.

TWO—BUCYRUS-ERIE—GA-3, GAS-AIR 1¼-yard shovels, Wisconsin D-2—6 cyl. 5¼"x6½" Engines. Good condition. St. Paul, Minnesota. Box 1097-SS.

BUCYRUS-ERIE 41-B — 1¼-YARD STEAM SHOVEL. Located near Boston. Electric light plant. Very good price. Box 1096-SS.

BUCYRUS-ERIE—41-B—STEAM SHOVEL. 21' boom, 15' dipper handle, 1¼-cubic yard dipper. Now operating. Will demonstrate. Located Alabama. Box 1131-SS.

BUCYRUS-ERIE GA-3—Gas-Air 1¼-yard high lift shovel and 45' boom clamshell machine. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Located New Mexico. Box 2148-SS.

If You Do Not Find What You Want Listed—Write Us
EXCAVATING
South Milwaukee, Wis.

LIMA MODEL 101. 1¼-yard gas shovel. 50' boom dragline. Excellent condition. Located Texas. Box 2029-SS.

2—LIMA MODEL 101. 1¼-yard gasoline shovels. 26' boom, 17' dipper handle. Waukesha Model J. K. 6½"x7" engine. Recently rebuilt. Excellent condition. Located Texas. Box 2042-SS.

LORAIN 75-A 1¼-yd. Gas shovel. Good operating condition. Located near Boston. Box 2118-SS

2 MARION Model 450—Steam Shovels. Good condition. Located Connecticut. Box 1154-SS.

MARION MODEL 32—1¼-yd. steam shovel. Boiler inspected February 1, 1938. Machine in good condition. Located Eastern Pennsylvania. Box 2101-SS.

OSGOOD. 1¼-yard gasoline shovel. 1-yard dipper also available. 4-cylinder Leroi gas engine. Only operated three months since $2,000 repairs applied. Excellent condition. Located Texas. Box 2043-SS.

1½-YARD

BUCYRUS-ERIE 37-B Diesel Chain crowd shovel. 1½-yd. 30" cat. treads. Caterpillar D-13,000 6-cylinder 5¾"x8" engine. Wired for lights. Practically new condition. New machine guarantee. Available 30 days. Located Western Pennsylvania. Box 2128-SS

BUCYRUS-ERIE 37-B Gas 1½-yd. shovel. Electric starter and battery lights. Gasoline fuel pump. Wisconsin 6-cylinder 5½"x6½" engine. Machine rebuilt 1933. Good working condition. Located Eastern Pennsylvania. Box 2091-SS.

BUCYRUS-ERIE—42-B STEAM shovel. 1½-yard Vanderhoef quarry dipper. Very good mechanical condition. Can be demonstrated. Located Georgia. Box 1149-SS.

BUCYRUS-ERIE 37-B—1½ yard Chain crowd gas shovel. Wisconsin D-3 engine. Located Minnesota. Box 2075-SS.

P&H MODEL 700-B. 1½-yd. Gasoline shovel. Waukesha engine. Good condition. Located Connecticut. Box 2114-SS.

1¾-YARD

One 701 Koehring shovel equipped with a 1¾-yard special rock dipper and D13000 Diesel engine, purchased 1936. Can be seen on the job near Corydon, Indiana. Box 2143-SS.

BUCYRUS-ERIE 43-B Diesel 1¾-yd. Chain crowd shovel. Buda-Lanova 6-cylinder 5¼"x7" engine. Used less than one year. Very good condition. Located Connecticut. Box 2115-SS

BUCYRUS-ERIE 43-B Gas combination shovel and dragline. Shovel dipper 1¾ yd. Dragline boom 60'. 1½-yd. drag bucket. Long axles. 33" treads. Electric starter. Wisconsin 6-cylinder 6"x7" engine. Good operating condition. Located Eastern Pennsylvania. Box 2092-SS.

BUCYRUS-ERIE 43-B late model 1¾-yd. chain crowd shovel. Electric starter. 1½ K.W. Kohler light plant. Buda-Lanova 6-cylinder 5¼"x7" Diesel engine. Located Central New York State. Excellent condition. Box 2019-SS.

5—MARION MODEL 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 2153-SS.

2-YARD

MARION MODEL 480—2-yd. Steam shovel. Vertical boiler. Boiler inspected February 1, 1938. Excellent condition. Located Eastern Pennsylvania. Box 2102-SS.

SMALL DRAGLINES
Under 2 Yards

½-YARD

MEAD-MORRISON, ½-yard 35' boom dragline and gas shovel, including ½-yd. Page drag bucket. Good operating condition. Located Minnesota. Box 2081-SD.

SPEEDER 42' Boom Dragline and ½-yard drag bucket. Caterpillar Diesel engine. Located Wyoming. Box 2173-SD

UNIVERSAL GASOLINE dragline. ½-yd. capacity. Crawler mounted. Located Indiana. Box 2127-SD

⅝-YARD

BYERS MODEL 128. ⅝-yd. Gas dragline 35' boom including ½-yd. Page "C" drag bucket. 4-cylinder Diamond T engine. Engine overhauled 1937. Good operating condition. Located Illinois. Box 2087-SD.

¾-YARD

BUCYRUS-ERIE 1030 Gas ¾-yard 40' boom dragline and rope crowd shovel. Located Texas. Box 2175-SD

NORTHWEST MODEL 105 GAS—40' boom dragline and clamshell, including Page "C" drag bucket. Climax engine. Reasonably good operating condition. Located Atlanta, Ga. Box 995-SD.

OSGOOD. COMMANDER. Combination dragline, shovel and clamshell. 35' dragline and clamshell boom. ¾-yard Page drag bucket. ¾-yard Rock Type dipper. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SD.

⅞-YARD

BUCYRUS-ERIE 1035 Gasoline 40' boom dragline and clamshell, including 1-yd. dragline and clamshell buckets. 26" cat. treads. Waukesha engine. Recently overhauled. Located Colorado. Box 2177-SD

P&H MODEL 206-B combination dragline and clamshell. 40' boom. Waukesha engine. Good condition and appearance. Located Florida. Box 2105-SD.

1-YARD

BUCYRUS-ERIE 30-B Diesel 40' boom dragline. Atlas Diesel 3-cylinder 8½"x10½" engine. $1,500 repairs recently applied. Excellent condition. Located near Chicago. Box 2132-SD

BUCYRUS-ERIE 32-B Gas 50' boom dragline and 1-yd. "U" Drag bucket. Electric starter. Wisconsin engine. Good operating condition. Located Eastern Pennsylvania. Box 2088-SD.

BUCYRUS-ERIE DA-2 DIESEL-AIR 40' BOOM dragline. No bucket. Atlas Diesel engine. Located Eastern Pennsylvania. Box 872-SD.

BUCYRUS-ERIE — D-2 — DIESEL DRAGLINE. Atlas engine. Located Texas. 40' Boom, 1¼ yd. Page Bucket. Field reconditioned. Excellent mechanical and operating condition. Box 1020-SD.

1¼-YARD

BUCYRUS-ERIE 34-B Diesel combination 1¼-yd. 45' boom dragline and shovel, including 1¼-yd. drag bucket and Kohler light plant. 30" cat. treads. Caterpillar D-11,000 engine. Used only about 8 months. Excellent condition and appearance. Located Kansas. Box 2172-SD

BUCYRUS-ERIE E-2 Diesel 45' boom dragline and 1¼-yard Page bucket. Fair working condition. Located Kansas. Box 2173-SD

BUCYRUS-ERIE E-2 dragline and shovel. 45' boom plus 10' extension. 1¼-yard Page drag bucket. 1½-yard plate dipper. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SD.

LIMA MODEL 101, 1¼-yd. gas 50' boom dragline and shovel. Excellent condition. Located Texas. Box 2029-SD

P & H—MODEL 210—55' boom dragline including 1¼-yard Page bucket. Gas powered. Located South Dakota. Box 1172-SD

1¾-YARD

BUCYRUS-ERIE 43-B gas combination dragline and shovel. Dragline boom 60'. 1½-yd. drag bucket. Shovel dipper 1¾ yd. Long axles. 33" treads. Electric starter. Wisconsin 6-cylinder 6"x7" engine. Good operating condition. Located Eastern Pennsylvania. Box 2092-SD.

NORTHWEST MODEL 8 Gasoline dragline. 60' boom. 2-cu. yd. Page bucket. Twin City 7¾"x9" engine. 1500 Watt Kohler light plant. $4,000 repairs and overhauling recently applied. Excellent condition. Located near Memphis, Tenn. Box 2138-SD

2-YARD

BUCYRUS-ERIE 45-B Diesel Dragline. 75' boom. Buda DC-27 6-cylinder 6¼"x8¾" engine. Electric starter. 2¼ yd. Omaha drag bucket. Long cat side frame. Kohler light plant. Good operating condition. Located Nebraska. Box 2111-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY—⅜-YARD GAS CLAMSHELL. Located near Boston. Box 1084-SCC.

½-YARD

BUCYRUS-ERIE — TYPE A, ½-yard steam clamshell and shovel. 26' clamshell boom. Cat. mounted. Located Central Illinois. Box 2007-SCC.

FOR SALE

Address all box numbers c/o EXCAVATING engineer . . . . . at South Milwaukee, Wisconsin

⅝-YARD

BROWNHOIST 40′ boom steam locomotive crane. Standard gauge car wheel mounting. Fair condition. Located vicinity Chicago. Box 2135-SCC

P & H MODEL 204. 35′ boom gasoline clamshell. ⅝-yard Kiesler clamshell bucket. Waukesha engine. New cab. Generally very good condition. Located Chicago. Box 2036-SCC.

¾-YARD

BUCYRUS-ERIE—TYPE B, ¾-yard, 40′ boom steam clamshell and shovel. Cat. mounted. Located Buffalo, New York. Box 2005-SCC.

BUCYRUS-ERIE TYPE B, steam, ¾-yard 36′ boom clamshell and shovel, including ¾-yard Williams clamshell bucket. Located Central New York. Box 1188-SCC.

NORTHWEST MODEL 105 GAS—40′ boom clamshell and dragline, including Page "C" drag bucket. Climax engine. Completely reconditioned. Located Atlanta, Ga. Box 995-SCC.

NORTHWEST MODEL 105, combination clamshell and shovel. 40′ clamshell boom. Type "C" Lakewood 1-yard clamshell bucket. 24′ shovel boom. 17½′ dipper handle. ¾-yard dipper. Twin City gasoline engine. Reasonably good condition. Located near Chicago. Box 2045-SCC.

OSGOOD. COMMANDER. Combination clamshell, dragline and shovel. 35′ clamshell and dragline boom. ¾-yard Page drag bucket. ¾-yard Rock Type dipper. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SCC.

⅞-YARD

BUCYRUS-ERIE 1035 Gasoline 40′ boom clamshell and dragline including 1-yd. clamshell and dragline buckets. 26" cat. treads. Waukesha engine. Recently overhauled. Located Colorado. Box 2177-SCC

P&H MODEL 206-B Combination clamshell and dragline. 40′ boom. Waukesha engine. Good condition and appearance. Located Florida. Box 2105-SCC.

1-YARD

BROWNHOIST 50′ boom steam locomotive crane. Standard gauge car wheel mounted. Overhauled 1937. Located vicinity Chicago. Box 2136-SCC

BUCYRUS-ERIE — GA-2 — GAS-AIR 45′ Boom Clamshell Machine. Good Operating Condition. Located St. Paul, Minn. Box 1024-SCC.

BUCYRUS-ERIE — GA-2 GAS AIR Clamshell. 45′ boom. Single Shaft Caterpillar. Waukesha 4 cylinder 6¼"x8" engine. Rebuilt since original manufacture. Good operating condition. Located New Jersey. Box 1104-SCC.

NORTHWEST—MODEL 105—gasoline clamshell and shovel—1-yard. Located Massachusetts. Box 1123-SCC.

P&H MODEL 600, 1-yd. gasoline shovel. Crane equipment also available. Waukesha engine. Good condition. Located Connecticut. Box 2113-SCC

P. & H. MODEL 600—40′ BOOM GAS clamshell and 1-yard shovel. Waukesha JL-6"x7" Engine. Located North Carolina. Box 1095-SCC.

P&H MODEL 600A 1-yard 40′ boom crane and gas shovel. Electric starter and lights. Waukesha 4-cylinder 6"x7" Model J. L. engine. $1500 recently spent overhauling. Good condition and appearance. Located Central Wisconsin. Box 2084-SCC.

1¼-YARD

BUCYRUS-ERIE GA-3 — Gas-Air 1¼-yd. 45′ boom clamshell and high lift shovel. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SCC.

BUCYRUS-ERIE 41-B Steam Crane. 55′ boom. Equipped for pile driving. Oil burner. Boiler flues replaced 1936. Fair condition. Located vicinity Chicago. Box 2089-SCC.

If You Do Not Find What You Want Listed—Write Us

EXCAVATING engineer
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LINK-BELT, MODEL K-2. Gas crane. 50′ boom. Also 2 extra 20′ inserts to make 90′. Weight 67,000 lbs. Located St. Paul, Minn. Box 2013-SCC.

BROWNING MODEL 25-T Steam locomotive crane—8-wheel truck mounted with outriggers. Capacity 48,000 lbs. at 15′ radius. 50′ boom. 1¼-yd. Williams clamshell bucket included. Vertical boiler. 125 lbs. working pressure. Inspected November 1937. Approved for use Pennsylvania, New York and New Jersey. Located Eastern Pennsylvania. Box 2112-SCC.

1½-YARD

2—BUCYRUS-ERIE 37-B's Gasoline Special Clamshell Machines. Vertical Tagline. Accelerator control on engine. Special hoist gear and pinion to increase line speed. 30" Cat. treads. Electric starter. 10,000-lb. counterweight. Wisconsin "E" 6-cylinder 6"x7" engine. Good operating condition. Located Boston. Box 2160-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

BUCYRUS-MONIGHAN 1½-T Diesel dragline. 60′ boom. Located Kansas. Box 2168-LSD

BUCYRUS-MONIGHAN 2-T Diesel Dragline. 70′ boom. Located Kansas. Box 2169-LSD

BUCYRUS-MONIGHAN 2-W Diesel dragline. 70′ boom. Located Louisiana. Box 2170-LSD

BUCYRUS-MONIGHAN 3-T Diesel dragline. 77′ boom. Located Louisiana. Box 2171-LSD

BUCYRUS-MONIGHAN 2-W Diesel Dragline. 65′ boom. 2½-yd. Monighan bucket. Fairbanks-Morse engine. Recently overhauled. Located Texas. Box 2176-LSD

BUCYRUS-MONIGHAN 4-T Diesel Dragline. 150′ boom. 1 each 3-cu. yd. and 4-cu. yd. buckets. Fairbanks-Morse 240 HP engine. Located Southern Illinois. Box 2157-LSD.

2—BUCYRUS-ERIE 52-B's Ward Leonard Electric combination shovel and dragline. 30′ shovel boom 18′ dipper handle 2¼-yd. dipper. 70′ boom dragline equipment and 2¼-yd. drag bucket. 3 motors—3 phase 60 cycle 2300 volt. 2 flood lights. Very good condition. Located Eastern Pennsylvania. Box 2094-LSD.

BUCYRUS-ERIE 50-B Diesel Combination shovel and dragline. New 1¾-yd. Esco dipper. 50′ dragline boom including 1½-yd. Page drag bucket. Atlas 4-cylinder 9"x12" engine. Good working condition. Located Montana. Box 2107-LSD.

BUCYRUS-ERIE 50-B, 2-yd. steam shovel. Good operating condition. Located Central New York State. Box 2020-LSD.

BUCYRUS-ERIE 100-C. 3-yard steam shovel. Cat. mounted. Fair condition. Located Kansas. Box 2049-LSD.

BUCYRUS-ERIE 95-C. 3-yard steam shovel. Cats. installed 1925. Fair condition. Located Kansas. Box 2050-LSD.

MARION MODEL 60. 2½-yard steam shovel on railroad trucks. Good appearance and condition. Located Kansas. Box 2051-LSD.

CLASS 320 STEAM DRAGLINE, 144-foot boom. 8-yard bucket. Located on Illinois river. A good buy. Box 2155-LSD.

CLASS 250 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 2152-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 2164-LSD.

2—BUCYRUS-ERIE 100-B steam shovels, worked only 15 months. Also, 2 Ingersoll-Rand Diesel compressors. Very low prices for immediate sale. H. W. Nelson, 1 Wall St., New York.

P&H MODEL 900, 3½ yard Diesel Shovel, 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 2151-LSD.

BUCYRUS-MONIGHAN 4-W Walking dragline, 80′ boom 5½ yard Page bucket, 30′ boom insert and 4-yard bucket. Located Tennessee. Box 2150-LSD.

ANY FAIR OFFER ACCEPTED

Class 24 steam dragline. 100 foot boom, 5 cubic yard buckets. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 2149-LSD.

BUCYRUS-MONIGHAN MODEL 6160—Diesel Dragline. 160′ boom. 6-yard drag bucket. Fairbanks-Morse Diesel engine. $15,000 extras added since machine was recently purchased. Will rent. Located Montana. Box 2068-LSD.

BUCYRUS-ERIE — TOWER EXCAVATOR. 130′ head tower. 50′ tail tower. 12-yard bottomless bucket. Electrical equipment 3 phase 60 cycle 4000 volts Ward Leonard. WILL RENT. Located Louisiana. Box 2069-LSD.

BUCYRUS-ERIE — 52-B — DIESEL 2¼ yard Shovel and Dragline. Atlas engine. Good condition. Located Eastern Pa. Box 1039-LSD.

BUCYRUS-ERIE — 100-B — STEAM SHOVEL. 3 yard Dipper. Revolving machinery, very good condition. Located Montreal, Canada. Box 1041-LSD.

BUCYRUS-MONIGHAN—MODEL 4-T — 4-yard Diesel Dragline. 110′ Boom. Good Condition. Located Nebraska. Box 1047-LSD.

BUCYRUS-ERIE 50-B Diesel Dragline. 50′ boom. 2-yard Page "M" drag bucket. Kohler Light Plant. Atlas Engine. Overhauled completely 1937. Actually used only 4 years. Good condition. Located Illinois. Box 2083-LSD.

BUCYRUS-ERIE 175-B 2 Motor AC Electric Dragline. Truck Mounted. 125′ boom. 1 each 4-, 5-, and 6-yd. drag buckets. Chain drive from main motor to intermediate shaft. Extra rotors for main and swing motors and other spare parts. 3—75 KVA 60 cycle 2200/220/440 volt transformer mounted on machine. Power supply 3 phase 60 cycle 440 volt. Completely overhauled since received from factory. First class operating condition. Located Kansas. Box 2082-LSD.

BUCYRUS-ERIE 5-W Diesel Dragline. 90′ Boom. Electric swing. Vortex Air Oil Cleaners. Electric fan in operators platform. 5-yd. "Y" drag bucket. Fairbanks Morse 250 HP Type 38-D 5-cylinder 10"x10½" pump scavenging engine. Auxiliary Waukesha gas engine. Good working condition. Located Colorado River Aqueduct near Indio, Cal. Available March 15. Box 2079-LSD.

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LARGE SHOVELS AND DRAGLINES
2 Yards and Over continued

BUCYRUS-MONIGHAN 5-W Diesel Dragline. 80' Boom. Electric swing. Vortex Air Oil Cleaners. Electric fan in operator's platform. 6-yd. "Y" drag bucket. Fairbanks Morse 250 HP Type 33-D 5-cylinder 10"x10½" pump scavenging engine. Auxiliary Waukesha gas engine. Good working condition. Located Colorado River Aqueduct near Indio, Cal. Available March 15. Box 2080-LSD.

MARION—MODEL 350—3 yard Electric Shovel. Power equipment, 3 Phase, 60 cycle, 2300 volt — Ward-Leonard Control. Mounted on railway trucks. Good condition. Located Minnesota. Box 1049-LSD.

MARION — MODEL 70-E — 3½ yard Electric Shovel. Railway truck mounted. Power Equipment. 3 Phase, 60 cycle, 2300 volt. Good condition. Located Ohio. Box 1050-LSD.

PAGE—MODEL 220—2½ yard Diesel Dragline. 85' Boom. Good operating condition. Located Iowa. Now operating. Box 1052-LSD.

BUCYRUS-MONIGHAN 3-T DIESEL dragline. 80-ft. steel boom, 8 cu. yd. drag bucket, 120 h.p. Fairbanks-Morse type "YVA" engine. 1500 watt Kohler light Plant. Working at Little Rock, Ark. Box 1056-LSD.

BUCYRUS-ERIE — 75-B Electric Combination Shovel and Dragline. 29-ft. shovel boom, 20-ft. dipper handle, 2½-yard dipper, 85-ft. dragline boom with mast suspension. Suitable for power supply, 3 phase, 60 cycle, 2300 volt. Induction motors. Said to be in excellent working condition. Located Eastern Pennsylvania. Box 1058-LSD.

BUCYRUS-ERIE 55-B—Extra High Lift Diesel Shovel. 35-ft. boom. 22-ft. dipper handle, 2 cu. yd. Bowl Door dipper. Caterpillar mounted. Kohler light plant. Atlas Diesel engine. Used about three months. Just like new. Located Eastern Pennsylvania. Box 1069-LSD.

PAGE — MODEL 220 — Electric dragline. 90' boom, 3½-yard Page R.C. drag bucket. Box 1124-LSD.

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LOCOMOTIVES

STANDARD GAUGE LOCOMOTIVES BARGAINS

1—Baldwin 45-ton 17x24
2—Baldwin 77-ton 19x26
9—Baldwin 51-ton 17x24
4—American 60-ton 20x26
Located in Minnesota.
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MISCELLANEOUS EQUIPMENT

SHOVEL ATTACHMENT

1½-Yd. Dipper, Dipper Stick, Boom for Link-Belt K-44, K-38 or K-42 shovel. Used only few months. Excellent condition. Bargain Price.

ARMOUR FERTILIZER WORKS
Chicago Heights, Ill.

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1—20-TON all steel Guy derrick. 80' mast. 75' boom complete with 6 Guy cables approximately 250' long. Includes Dake steam engine driven winch bolted on side of mast complete with load and cables. Also electric motor in addition to Dake engine. Hand swing. Also included one Westinghouse cross-compound steam driven air compressor. Approximate weight 20,000 lbs. Located Wisconsin. Box 2156-ME.

LOCOMOTIVE CRANES

4—Standard gauge locomotive cranes, three —20-ton, one—10-ton. Offered at bargain prices. Located Minnesota.
Box 2146-ME.

BROWNHOIST Steam Locomotive crane. 44' boom. 8-wheel standard gauge MCD coupling. Lifting capacity 20,000 lbs. at 20' radius. One each 1-yd. and 2-cu. yd. clamshell buckets available. Located Wisconsin. Very good condition. Box 2137-ME

PLACER MINING EQUIPMENT, consisting of complete washing plant with trommel screen, pumps, stacker, etc. and a Speeder ½-yd. 42' boom Diesel dragline including ½-yd. drag bucket. Excellent condition. Located Wyoming. Box 2134-ME

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EXCAVATING engineer
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2—14 Cu. Yd. LaPlante-Choate Wagons
2—75 Caterpillar-Diesel Tractors
(Above equipment like new)
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1—2¼ Cu. Yd. Page Dragline bucket, A-1 condition
1—1½ Cu. Yd. Page Dragline bucket, A-1 condition
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A large variety of power sizes and power characteristics; also switches, controls, etc. Write us your requirements.
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FRUEHOFF SEMI-TRAILER with 8' by 40' Deck. (Can be shortened.) Single rear axle with 4 wheels each with 36"x10" solid rubber tires. Air Brakes. 16 ton capacity. Excellent condition. Located New York. Box 1160-ME.

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BUCYRUS-ERIE 1½-YARD Type "Y" Drag Bucket. Good condition. Located Kansas. Box 1166-ME.

DRAGLINE EQUIPMENT

72-ft. Dragline Boom and Fairlead—Hydraulic Equipment—1 Hoist Drum—1 Drag Drum—1 Boom Suspension, Sway Brace and Suspension Cables. All suitable for application to Bucyrus-Erie Model 75-B Machine. Located Eastern Pennsylvania. Box 1060-ME.

HAISS EXCAVATOR — C7097, June 1930. Weight 11 tons. Needs new teeth. 33" per minute crowding. Price $1800. Box 990-ME.

CAR TRANSPORTER

CAR-TRANSPORTER or stacker with reach of 135' and dumping height of 75'. Equipped with 4-yard aluminum car. Caterpillar-mounted and suitable for use with shovel having per hour output of 250 yards. Electric drive, 3-phase, 60-cycle, 4000-volt current. This car transporter is in excellent condition and priced to sell. Located near Kansas City, Missouri. Box 2010-ME.

SHOVEL EQUIPMENT—Late design—suitable for Bucyrus-Erie 52-B Diesel. Only handled about 4,000 yards material. Equipment located Alabama. Box 1113-ME

FRONT FOR 32 MARION

1½ CU. YD. shovel front end—new dipper—for Marion 32 steamer. Priced right. Located near Chicago. Box 2165-ME.

INDUSTRIAL STEAM WRECKING DERRICK. Non-propel. Rating 50 tons at 20' with outriggers. Located Nebraska. Box 1171-ME

BARBER-GREENE—MODEL B-44 ditcher. Located North Carolina. Box 1180-ME

KOEHRING DRAG SHOVEL equipment for Model 301 machine. Used very little. Low price. Located Eastern New York State. Box 1181-ME

USED CONTRACTORS EQUIPMENT

1—Model 100 Lincoln Revolver with 100' boom and 12' Gantry.
2—275 Koehring Mixers with Electric motors.
1—200-ton Blaw-Knox Bin with weighing batchers, cement scale and push button control.
1—Robinson Pneumatic cement unloader with silo.
1—20-ton Whitcomb Gasoline Dinkey, overhauled.
4—18-ton Steam Dinkeys, overhauled.
12—30-yd. Western Lift Door Air Dump cars.
4—30-yd. Koppel Drop Door Air Dump cars.
26—16-yd. K. & J. Lift Door Air Dump cars.
6—20-yd. K. & J. Lift Door Air Dump cars.
5—2-cu. yd. Blaw-Knox Roller gate Concrete Buckets.
7—70-ton 20x36 Baldwin Switchers.
3—Jordan spreaders excellent condition.
Located Mississippi valley. Box 2011-ME.

DRAG SHOVEL EQUIPMENT—consisting of 18' boom, 7'6" dipper handle and ¼-yd. front-opening dipper suitable for application to Bucyrus-Erie 1020 shovel. Located Rhode Island. Box 2003-ME.

EUCLID-TUWAY 11-CU. YD. dump wagon. Hydraulic hoist. Worked only 320 hours. Located Central New York State. Box 1189-ME.

ERIE AGGREMETER BIN—80-ton capacity with 3 compartments, including weighing scales. Only handled 10,000 tons. Located Central New York State. Box 1190-ME.

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Write for prices of this equipment. Save money. Located in Minnesota.
5—Boilers, locomotive and horizontal return tube types, 150 H.P.
14—Flat cars, 36" gauge, 18-ton.
3—Crushers, jaw, 44x28, 36x24 and Universal.
1—Motor, 135 H.P. squirrel cage, 1150 r.p.m., 220 v., 3 ph., 60 cy., A. C.; compensator.
3—Rotary converters, 300 Kw., HCC-6-300-1200, Forms P, D, & V, 6 and 3 phase.
1—Switchgear for 3-phase rotary converter, complete, semi-automatic.
3—Transformers, 300 Kw., 66,000 V. Primary, reconnected for 22,000 V. Primary.
1—Ainley placer gold machine, complete. 4-bowl with feed hopper for dragline operation. 40-50 tons per hour.
3—Hoists, double and single drum.
1—Bucket loader.
8—Pumps, steam (1 gas engine driven) from 49 to 3700 g.p.m.
1—Tractor, Twin City No. 12-20.
1—Water softener, 5 ft., complete.
120—Batch boxes, oak, 55 cu. ft.
2—Drums mine hoist, dia. 50", width 40", flange 7", capacity 400' one-inch rope.
Box 2145-ME.

BLAST-HOLE DRILLS

14—Sanderson-Cyclone Model 14, non-traction—six Model 14-SR, traction type, electric blast-hole drills. Also six Loomis Clippers—Models 4 and 44, steam traction. All in good condition, available for immediate shipment. Located New York. Priced to sell. Box 2167-ME

WANTED

WANTED: Two good used No. 2 Vulcan Pile Hammers, standard width 19". Give complete information as to base and ram; state price and where they may be inspected.
Box 2179-ME